Fourth Review Conference
of the Parties to the Treaty
on the Non-Proliferation of Nuclear Weapons

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ACTIVITIES OF THE INTERNATIONAL ATOMIC ENERGY AGENCY DURING THE PERIOD 1985-89 RELEVANT TO ARTICLE IV OF THE TREATY ON THE NON-PROLIFERATION OF NUCLEAR WEAPONS.

(Prepared by the Secretariat of the IAEA
for the Fourth Review Conference of the Parties to the NPT)

Activities of the IAEA during the period 1985–89 relevant to Article IV of the NPT

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LIST OF ABBREVIATIONS

ARCAL	Regional Co-operative Arrangements for the Promotion of Nuclear Science and Technology in Latin America
ASSET	Assessment of Safety Significant Events Team
CAS	Committee on Assurances of Supply
CEC	Commission of the European Communities
CRP	Co-ordinated Research Programme
FAO	Food and Agriculture Organization of the United Nations
GATT	General Agreement on Tariffs and Trade
ICTP	International Centre for Theoretical Physics
IDAS	International Dose Assurance Centre
INIS	International Nuclear Information System
INSAG	International Nuclear Safety Advisory Group
INSSAR	Integrated Safety Assessment of Research Reactors
INWAC	International Radioactive Waste Management Advisory Committee
IOC-UNESCO	Intergovernmental Oceanographic Commission of UNESCO
IPERS	International Peer Review Service
IPF	Indicative Planning Figure
IRS	Incident Reporting System
ISO	International Organization for Standardization
ITC-UNCTAD	International Trade Centre UNCTAD/GATT
IUCN	International Union for Conservation of Nature and Natural Resources
NDT	Non-destructive Testing
NEA	Nuclear Energy Agency of the OECD
NUPAT	Nuclear Power Advisory Team
NUSS	Nuclear Safety Standards
OECD	Organisation for Economic Co-operation and Development
OSART	Operational Safety Review Team
OSIP	Operational Safety Indicators Programme
PSA	Safety Assessment Methology
RADWASS	Radioactive Waste Safety Standards
RAPAT	Radiation Protection Advisory Team
RCA	Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology

SAREC	Swedish Agency for Research and Co-operation in Developing Countries
SEG	Senior Expert Group
SISSA	International School for Advance Studies
SMPRs	Small and Medium Power Reactors
SSDL	Secondary Standard Dosimetry Laboratory
TACF	Technical Assistance and Co-operation Fund
TRCUD	Technical Review Committee on Underground Disposal
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
UNFSTD	United Nations Fund for Science and Technology for Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
WAMAP	Waste Management Advisory Programme
WANO	World Association of Nuclear Operators
WHO	World Health Organization

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1. Unless otherwise stated, all figures and statistics reflect status as at 31 December 1989.

2. All sums of money are expressed in United States dollars.

3. The designations employed and the presentation of material do not imply the expression of any opinion whatsoever on the part of the Secretariat concerning the legal status of any country or territory or area or of its authorities, or concerning the delimitation of its frontiers.

ARTICLE IV OF THE NPT

"1. Nothing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II of this Treaty.

2. All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. Parties to the Treaty in a position to do so shall also co-operate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world".

FINAL DECLARATION OF THE THIRD REVIEW CONFERENCE OF THE PARTIES TO THE TREATY ON THE NON-PROLIFERATION OF NUCLEAR WEAPONS (NPT/CONF.III/64/I)

Review of the Operation of the Treaty and Recommendations

Article IV and preambular paragraphs 6 and 7

1. The Conference affirms that the NPT fosters the world-wide peaceful use of nuclear energy and reaffirms that nothing in the Treaty shall be interpreted as affecting the inalienable right of any Party to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II.

2. The Conference reaffirms the undertaking by all Parties to the Treaty, in accordance with Article IV and preambular paragraphs 6 and 7, to facilitate the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy and the right of all Parties to the Treaty to participate in such exchange. In this context, the Conference recognizes the importance of services. This can contribute to progress in general and to the elimination of technological and economic gaps between the developed and developing countries.

3. The Conference reaffirms the undertaking of the Parties to the Treaty in a position to do so to co-operate in contributing, alone or together with other States or international organizations, to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of the non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world. In this context the Conference recognizes the particular needs of the least developed countries.

4. The Conference requests that States Parties consider possible bilateral co-operation measures to further improve the implementation of Article IV. To this end, States Parties are requested to give in written form their experiences in this area in the form of national contributions to be presented in a report to the next Review Conference.

5. The Conference recognizes the need for more predictable long-term supply assurances with effective assurances of non-proliferation.

6. The Conference commends the recent progress which the IAEA's Committee on Assurances of Supply (CAS) has made towards agreeing a set of principles related to this matter, and expresses the hope that the Committee will complete this work soon. The Conference further notes with satisfaction the measures which CAS has recommended to the IAEA Board of Governors for alleviating technical and administrative problems in international shipments of nuclear items, emergency and back-up mechanisms, and mechanisms for the revision of international nuclear co-operation agreements and calls for the early completion of the work of CAS and the implementation of its recommendations.

7. The Conference reaffirms that in accordance with international law and applicable treaty obligations, States should fulfil their obligations under agreements in the nuclear field, and any modification of such agreements, if required, should be made only by mutual consent of the parties concerned.

8. The Conference confirms that each country's choices and decisions in the field of peaceful uses of nuclear energy should be respected without jeopardizing their respective fuel cycle policies. International co-operation in this area, including international transfer and subsequent operations should be governed by effective assurances of non-proliferation and predictable long-term supply assurances. The issuance of related licences and authorization involved should take place in a timely fashion.

9. While recognizing that the operation and management of the back-end of the fuel cycle including nuclear waste storage are primarily a national responsibility, the Conference acknowledges the importance for the peaceful uses of nuclear energy of international and multilateral collaboration for arrangements in this area.

10. The Conference expresses its profound concern about the Israeli military attack on Iraq's safeguarded nuclear reactor on 7 June 1981. The Conference recalls Security Council Resolution 487 of 1981, strongly condemning the military attack by Israel which was unanimously adopted by the Council and which considered that the said attack constituted a serious threat to the entire IAEA safeguards regime which is the foundation of the Non-Proliferation Treaty. The Conference also takes note of the decisions and resolutions adopted by the United Nations General Assembly and the International Atomic Energy Agency on this attack, including Resolution 425 of 1984 adopted by the General Conference of the IAEA.

11. The Conference recognizes that an armed attack on a safeguarded nuclear facility, or threat of attack, would create a situation in which the Security Council would have to act immediately in accordance with provisions of the United Nations Charter. The Conference further emphasizes the responsibilities of the Depositaries of NPT in their capacity as permanent members of the Security Council to endeavour, in consultation with the other members of the Security Council, to give full consideration to all appropriate measures to be undertaken by the Security Council to deal with the situation, including measures under Chapter VII of the United Nations Charter.

12. The Conference encourages Parties to be ready to provide immediate peaceful assistance in accordance with international law to any Party to the NPT, if it so requests, whose safeguarded nuclear facilities have been subject to an armed attack, and calls upon all States to abide by any decisions taken by the Security Council in accordance with the United Nations Charter in relation to the attacking State.

13. The Conference considers that such attacks could involve grave dangers due to the release of radioactivity and that such attacks or threats of attack jeopardize the development of the peaceful uses of nuclear energy. The Conference also acknowledges that the matter is under consideration by the Conference on Disarmament and urges co-operation of all States for its speedy conclusion.

14. The Conference acknowledges the importance of the work of the International Atomic Energy Agency (IAEA) as the principal agent for technology transfer amongst the international organizations referred to in Article IV (2) and welcomes the successful operation of the Agency's technical assistance and co-operation programmes. The Conference records with appreciation that projects supported from these programmes covered a wide spectrum of applications, related both to power and non-power uses of nuclear energy notably in agriculture, medicine, industry and hydrology. The Conference notes that the Agency's assistance to the developing States Party to the Treaty has been chiefly in the non-power uses of nuclear energy.

15. The Conference welcomes the establishment by the IAEA, following a recommendation of the First Review Conference of the Parties to the Treaty, of a mechanism to permit the channelling of extra-budgetary funds to projects additional to those financed from the IAEA Technical Assistance and Co-operation Fund. The Conference notes that this channel has been used to make additional resources available for a wide variety of projects in developing States Party to the Treaty.

16. In this context, the Conference proposes the following measures for consideration by the IAEA:

(i) IAEA assistance to developing countries in siting, construction, operation and safety of nuclear power projects and the associated trained manpower provision to be strengthened.

(ii) To provide, upon request, assistance in securing financing from outside sources for nuclear power projects in developing countries, and in particular, the least developed countries.

(iii) IAEA assistance in nuclear planning systems for developing countries to be strengthened in order to help such countries draw up their own nuclear development plans.

(iv) IAEA assistance on country-specific nuclear development strategies to be further developed, with a view to identifying the application of nuclear technology that can be expected to contribute most to the development both of individual sectors and developing economies as a whole.

(v) Greater support for regional co-operative agreements, promoting regional projects based on regionally agreed priorities and using inputs from regional countries.

(vi) Exploration of the scope for multi-year, multi-donor projects financed from the extra-budgetary resources of the IAEA.

(vii) The IAEA's technical co-operation evaluation activity to be further developed, so as to enhance the Agency's effectiveness in providing technical assistance.

17. The Conference underlines the need for the provision to the IAEA of the necessary financial and human resources to ensure that the Agency is able to continue to meet effectively its responsibilities.

18. The Conference notes the appreciable level of bilateral co-operation in the peaceful uses of nuclear energy, and urges that States in a position to do so should continue and where possible increase the level of their co-operation in these fields.

19. The Conference urges that preferential treatment should be given to the non-nuclear-weapon States Party to the Treaty in access to or transfer of equipment, materials, services and scientific and technological information for the peaceful uses of nuclear energy, taking particularly into account needs of developing countries.

20. Great and serious concerns were expressed at the Conference about the nuclear capability of South Africa and Israel and that the development of such a capability by South Africa and Israel would undermine the credibility and stability of the Non-Proliferation Treaty regime. The Conference noted the demands made on all States to suspend any co-operation which would contribute to the nuclear programme of South Africa and Israel. The Conference further noted the demands made on South Africa and Israel to accede to the NPT, to accept IAEA safeguards on all their nuclear facilities and to pledge themselves not to manufacture or acquire nuclear weapons or other nuclear explosive devices.

21. The Conference recognizes the growing nuclear energy needs of the developing countries as well as the difficulties which the developing countries face in this regard, particularly with respect to financing their nuclear power programmes. The Conference calls upon States Party to the Treaty to promote the establishment of favourable conditions in national, regional and international financial institutions for financing of nuclear energy projects including nuclear power programmes in developing countries. Furthermore, the Conference calls upon the IAEA to initiate and the Parties to the Treaty to support the work of an expert group study on mechanisms to assist developing countries in the promotion of their nuclear power programmes, including the establishment of a Financial Assistance Fund.

22. The Conference recognizes that further IAEA assistance in the preparation of feasibility studies and infrastructure development might enhance the prospects for developing countries for obtaining finance, and recommends such countries as are members of the Agency to apply for such help under the Agency's technical assistance and co-operation programmes. The Conference also acknowledges that further support for the IAEA's Small and Medium Power Reactor (SMPR) Study could help the development of nuclear reactors more suited to the needs of some of the developing countries.

23. The Conference expresses its satisfaction at the progress in the preparations for the United Nations Conference for the Promotion of International Co-operation in the Peaceful Uses of Nuclear Energy (UNCPICPUNE) and its conviction that UNCPICPUNE will fully realize its goals in accordance with the objectives of resolution 32/50 and relevant subsequent resolutions of the General Assembly for the development of national programmes of peaceful uses of nuclear energy for economic and social development, especially in the developing countries.

24. The Conference considers that all proposals related to the promotion and strengthening of international co-operation in the peaceful uses of nuclear energy which have been produced by the Third Review Conference of the NPT, be transmitted to the Preparatory Committee of the UNPICPUNE.

INTRODUCTION

IAEA's ROLE AND RESPONSIBILITIES RELEVANT TO ARTICLE IV

1. Article III of the IAEA Statute authorizes the Agency, inter alia: "to encourage and assist research on, and development and practical application of, atomic energy for peaceful uses throughout the world; and, if requested to do so, to act as an intermediary for the purposes of securing the performance of services or the supplying of materials, equipment, or facilities by one member of the Agency for another; to make provision...for materials, services, equipment, and facilities to meet the needs of research on, and development and practical application of, atomic energy for peaceful purposes, including the production of electric power, with due consideration for the needs of the underdeveloped areas of the world; to foster the exchange of scientific and technical information on peaceful uses of atomic energy; to encourage the exchange and training of scientists and experts in the field of peaceful uses of atomic energy".

2. A Report is submitted annually to the IAEA General Conference and, thereafter, to the United Nations General Assembly. In addition, the Agency publishes a detailed account of its technical co-operation activities. For the period under consideration here, detailed documentation can be found in the Agency's Annual Reports and its annual reports on Technical Co-operation Activities.1/

3. In discharging its functions under its own Statute, the Agency also fulfills the role envisaged for "international organizations" in Article IV of the NPT. Its activities, under these statutory provisions and related to Article IV, were described by the Agency's Secretariat in the following reports: to the First Review Conference of the Parties to the NPT in 1975 for the period 1964-75 2/ to the Second Review Conference in 1980 for the period 1975-79 3/ and to the third Review Conference in 1985 for the period 1980-84 4/.

1/ IAEA Annual Report for 1985, GC(XXX)/775
" " " " 1986, GC(XXXI)/800
" " " " 1987, GC(XXXII)/835
" " " " 1988, GC(XXXIII)/873
" " " " 1989, GC(XXXIV)/915
The Agency's Technical Co-operation Activities in 1985, GC(XXX)/INF/234
" " " " " " 1986, GC(XXXI)/INF/244
" " " " " " 1987, GC(XXXII)/INF/256
" " " " " " 1988, GC(XXXIII)/INF/268
" " " " " " 1989, GC(XXXIV)/INF/280

2/ NPT/CONF.11 and NPT/CONF/11/Add.1

3/ NPT/CONF.II/7

4/ NPT/CONF.III/10

TRANSFER OF EQUIPMENT AND MATERIAL

EQUIPMENT COMPONENT OF TECHNICAL ASSISTANCE AND CO-OPERATION

4. Transfer of equipment is carried out by the IAEA through technical co-operation with its developing Member States. At the end of a project, ownership of equipment which has been supplied passes to the Government of the State concerned. In addition to equipment supplied through technical assistance projects in Member States, equipment is also donated to IAEA laboratories to support research activities that, in turn, support activities of various Member States conducted in that country.

5. The proportion of expenditures for equipment in the framework of the technical co-operation programme can be seen from the following table.

Period	Experts (%)	Equipment (%)	Training (%)
1970-74	33	35	32
1975-79	31	39	30
1980-84	24	51	25
1985-89	22	47	31

SUPPLY OF MATERIALS AND ENRICHMENT

6. Article IX of the Statute sets out a role for the IAEA as both custodian and supplier of nuclear material. Thus far the IAEA has played a limited role as "broker" between Member States, at their request, in regard to the transfer of nuclear materials. Nuclear material supplied under the technical co-operation programme during the period 1985-89 is listed in Annex I.

COMMITTEE ON ASSURANCES OF SUPPLY (CAS)

7. The Committee on Assurances of Supply (CAS) was established by the Agency's Board of Governors in June 1980 to consider and advise the Board on: first, ways and means in which supplies of nuclear materials, equipment and technology and fuel cycle services can be assured on a more predictable and longer-term basis in accordance with mutually acceptable considerations of non-proliferation; and second, the Agency's role and responsibilities in relation thereto.

8. Initially, CAS focused its attention on two subjects and established two Working Groups to carry forward, between sessions, its consideration of questions falling under them. Working Group 1 considered "principles for international co-operation in the field of nuclear energy in accordance with the mandate of the Committee on Assurances of Supply", and Working Group 2 considered "emergency and back-up mechanisms". Subsequently, CAS established a working group (Working Group 3) to consider the question of revision mechanisms.

9. While CAS agreed on revision mechanisms and on emergency and back-up mechanisms, it has not been possible to reach agreement on a set of principles for international co-operation; in 1987, the Committee agreed to make a pause in its formal discussions and to continue to assess prospects in informal consultations. The Secretariat was requested to review the international supply and demand situation to assist in this process (see Annex II.A).

10. In the first half of 1990, CAS continued informal consultations based on an up-dating of the Secretariat's review of the supply and demand situation (see Annex II.B). In June 1990, the Board of Governors approved the continuation of informal consultations for another year.

TRANSFER OF SCIENTIFIC AND TECHNOLOGIGAL INFORMATION

NUCLEAR POWER

(a) Nuclear Power Development

11. At the end of 1985, there were 374 nuclear power units with a total generating capacity of 250 GW(e) in operation. Nuclear power contributed 15% of the total electricity generated in 1985.

12. At the end of 1989, the installed capacity of nuclear power plants had increased by more than 20%, reaching 426 units in operation with a total capacity of 318 GW(e). A further 96 units with a total capacity of 79 GW(e) were under construction at the end of 1989. In 1989, 16.8 % of the world's electricity was generated using nuclear power.

(b) Promotion and Financing of Nuclear Power Programmes in Developing Countries (see NPT III Final Declaration para. 16(ii)).

13. Following discussions in the Board of Governors in February 1986, a senior expert group (SEG) was established to study mechanisms to assist developing countries in the promotion and financing of their nuclear power programmes. The group focused on defining the constraints on the introduction of nuclear power in developing countries and how they have evolved. Responses from selected Member States to a questionnaire on the constraints experienced by them permitted a systematic review of ways and means of overcoming those constraints, of which the difficulty of obtaining financing is a major one.

14. The question of financing was examined by a sub-group which concluded that for many developing countries the financing of nuclear power is hampered by: first, doubt about the credit-worthiness of the country; second, the fact that the present scheme of export credits, which is governed by the terms of the OECD Sector Understanding on Export Credits for Nuclear Power Plants, is unfavourable to nuclear power plants vis-à-vis fossil fuelled power plants; and third, the technical and financial uncertainties associated with nuclear power projects, such as delays connected with regulatory aspects or political opposition, which increase the financial risks. The sub-group recommended close co-operation between the Agency and the World Bank both in electric power sector studies and in energy and nuclear power planning studies. Also, it outlined a series of actions which might be taken by lenders, suppliers/investors, international agencies and developing countries.

15. In its report (Annex 3), the SEG recommended a number of actions to be taken by the Agency in four areas: energy and nuclear power planning, public acceptance, project preparation and implementation, and nuclear power financing.

(c) Assistance to Member States – Integrated Approach to Energy, Electricity and Nuclear Power Planning (see NPT III Final Declaration para. 16(i) and (iii)).

16. Over the years, the IAEA has developed a comprehensive framework of information, software packages, methodologies and expertise to assist its developing Member States in strengthening their capabilities in energy, electricity and nuclear power planning. Towards this goal, Member States are offered the set of IAEA's planning software packages, methodologies and approaches. Special emphasis is given to provide adequate training in the use of these planning tools and methods. Such traninig is covered through the regular IAEA programme of training courses at inter-regional, regional and national levels. Complementary training is also provided through the conduct of country studies based on these metholologies. Several of these energy, electricity and nuclear power planning studies have been conducted by the IAEA in recent years for certain Member States (Algeria, Egpyt, Hungary, Jordan, Indonesia, Malaysia, Thailand, Tunisia, Turkey and Venezuela). More specific studies on infrastructure development (e.g. industrial capabilities for nuclear power programmes, public information system, manpower development) have also been conducted in co-operation with some Member States.

17. On the basis of the experience gained with these individual activities, the IAEA can organize an integrated package of assistance to be administered on a multiyear country specific basis tailored to the requirements of a particular developing country.

18. The integrated assistance package is to be based on the following premises: first, nuclear power is considered only when the country is at a stage such that nuclear power is technically feasible and when it would be part of a least-cost long-term energy and electricity supply strategy considering all alternatives and relevant economic factors. Second, a nuclear programme is launched only when it has a definite chance of being successful, e.g. it can be executed within the planned schedule and with the financing available. Third, a nuclear power project is finally committed only after comprehensive planning, and when steps have been taken to meet all necessary supporting infrastructure requirements, including assurance of financing.

19. The IAEA intends to offer the integrated assistance package with the aim of assisting in the alleviation of the two main problems faced by developing countries that are either involved in or considering a nuclear power programme, namely: first, inadequate ability to establish, maintain and develop the capability for energy demand and supply planning; second, lack of the necessary infrastructures. Many developing countries already involved in or considering a nuclear power programme need impartial advice and assistance in developing the infrastructures required to support the execution of such a programme, including the development of personnel training programmes.

20. The integrated approach will unify individual IAEA activities in energy and electricity demand analysis and generation expansion studies with the activities in infrastructure, and, particularly, manpower development.

21. During the planning stage, this integrated approach will include: first, the required planning and preparatory studies and activities to establish an adequate basis for a sound decision to launch a first nuclear power project; and second, the establishment of a definite sequence and schedule for implementation so as to make it possible to build up on an integrated basis, an adequate infrastructure and to avoid unnecessary delays.

22. A basic component of the integrated package of assistance is to provide training in the use of the IAEA methodologies, which include: first, an assessment of the needs for energy, electricity and nuclear power within the overall context of economic development of a country; and second, an analysis of the infrastructure requirements and their development, with particular emphasis on manpower.

23. The IAEA's technical co-operation (TC) programme will be the primary vehicle for delivering the integrated assistance package. Depending on the specific situation in the individual country, the assistance provided could include either all or specific elements of this integrated package. For each requesting country, the scope of a TC project will be defined through detailed pre-project planning, which will include reconnaissance missions (i.e. Nuclear Power Planning Advisory Team (NUPAT) missions) for assessing specific requirements.

24. In administering the integrated package of assistance, all available means for exchange of information and transfer of experience, such as meetings, workshops, transferring planning methodologies, training courses, on-the-job training, seminars, technical reports, guidebooks, nuclear safety guides, expert services, fellowships, advisory missions and scientific visits, will be used.

(d) Small and Medium Power Reactors

25. To assist, primarily, developing Member States in the introduction of nuclear power, the IAEA has been conducting studies relating to small and medium power reactors (SMPRs) over three decades. The efforts in the past were aimed at promoting the industrial production of nuclear power plants smaller than those that were generally available on the international market as well as estimating the potential market for SMPRs among the developing countries, the reason being that SMPRs were seen as a possible means of overcoming both grid and financing constraints.

26. A recent study by the IAEA (Small and Medium Power Reactors: Project Initiation Study, Phase I, IAEA-TECDOC-347, Vienna, 1985) had shown that several SMPR designs in the size range 100-500 MWe could be offered to developing countries, but in most cases there were no recently built reference plants. In general, the price of the generated electricity would be expected to be higher for smaller power plants than for larger plants. There is also no recent capital cost experience concerning exported plants on which economic assessments could be based. Thus, the economic viability of SMPRs as compared with fossil fuelled power plants is more difficult to demonstrate than it is for larger nuclear power plants.

27. There is, nevertheless, a very large body of experience available from the construction and operation of nuclear power plants in the power range below 600 MWe. One hundred and thirty-nine units in this size range are in operation/construction in 25 countries out of the total of 32 countries having nuclear power plants in operation/construction as of December 1988. Currently a total of 23 SMPRs are under construction in 7 countries. The majority are Soviet designed VVER-440s (12 units) and Indian designed PHWRs (8 units). 10 additional PHWR units are reported to have been approved for construction in 1989 in India. However, it must be emphasized that in most cases these plants were the largest ones beingbuilt by their owners at that point of time. Experience on the performance of nuclear power plants below 600 MWe has also been quite good, with an accumulated operating experience of 1853 reactor-years out of a total of 5041 reactor-years for all nuclear plants. Their average energy availability factor has been consistently better than that for the larger units over the past ten years, possibly due to the greater average age of the smaller units enabling a stabilized operating regime.

28. However, there was a lack of confidence on the part of potential buyers, as for many years no SMPR designs were offered by suppliers and because the economics of the present designs appeared to them to be too uncertain. Vendors were not spending the time and effort necessary to develop reliable cost information as they were not sure about the potential market. Thus there has been an impasse for some time. To remedy this situation it was considered necessary to undertake a detailed feasibility study with the joint participation of the potential buyer and seller. The IAEA has offered such a study as a "footnote a/" technical co-operation project since 1986 (see paragraph 97). Egypt requested such a feasibility study as part of the assistance under the IAEA regular programme of technical co-operation for 1988-89. Some vendor countries agreed to support this study.

29. The widespread public concern about nuclear safety in the wake of Three Mile Island and Chernobyl gave a new emphasis to the development of advanced reactors with passive safety systems and certain characteristics that can be termed as inherently safe. The trend is towards simplicity and smaller unit sizes in the range of about 600 MWe capacity. This trend, which was noticeable even at the time of completion of the SMPR Project Initiation Study in 1985, has been steadily gathering momentum and some of the designs have been elaborated to a fairly detailed stage. These include advanced light water reactors (APWR, SBWR, PIUS, etc.), heavy water reactors (CANDU-3, CANDU-6), gas cooled reactors (MHTGR, HTR) and sodium cooled reactors (FBRs, PRISM). Thus there are now several designs of advanced nuclear reactors of both evolutionary and revolutionary variety, some with a high degree of design completion. Cost estimates have also been made by the vendors but they need to be confirmed by the actual construction of a plant. However, the vendors appear to be confident that the advanced SMPR designs on the basis of simplification of systems, modularization, maximized shop fabrication, series production and shorter construction periods could be competitive not only with fossil fired plants but also with the larger nuclear power plants.

30. Recognizing the financial constraints faced by most developing countries, the senior expert group set up by the IAEA considered various measures and contract arrangements such as multisupplier and multibuyer projects and cofinancing with multilateral financing institutions such as the World Bank. The build-operate-transfer (BOT) approach was considered the most promising. A distinctive feature of the BOT model is the inclusion of foreign investors in the ownership and management of the nuclear power station. A joint venture utility (JVU) would be established with equity participation by the utilities concerned and other organizations in the buyer country, as well as by foreign suppliers and financial institutions. The JVU would be responsible for financing, building and operating the nuclear power plant until all the debts were serviced. While the BOT model might offer an alternative financing scheme for countries which have a generally acceptable credit worthiness, it does not in itself overcome the basic problems of credit worthiness. The contractual arrangements necessary for identifying the responsibilities and risks for the various parties in the JVU are very complex and can, in themselves, introduce uncertainties into the project. To date, no nuclear power project has been implemented using the BOT model. The results of efforts by some countries (e.g. Turkey and Indonesia) in negotiating the feasibility of BOT projects would give an indication of the potential of this model.

APPLICATIONS OF NUCLEAR TECHNIQUES
(see NPT III Final Delcaration para. 16(iv))

31. The period 1985-89 exhibited a rate of expansion in the application of nuclear technology greater than that of the previous four year period. Furthermore these techniques were introduced into economic sectors not traditionally associated with these applications. Examples of such industrial applications are to be found in the paper industry, and in the prospection and recovery of mineral resources. There was evidence of the dynamic nature of the entire field with older techniques being replaced by newer more effective ones, and with the integration of nuclear with non-nuclear methods to increase the overall efficiency of a process.

32. The most dramatic impact of nuclear applications from the point of view of their overall benefit to mankind continue to be in the fields of medicine, enhancement of agricultural production and the preservation of agricultural products, and hydrological research.

33. The nuclear techniques referred to were developed primarily in the industrialized countries. They have, however, been widely adopted by the developing states and where use is expected to increase in the future.

34. Many of these developing countries have nuclear centres and the necessary scientific personnel to utilize new techniques effectively as they are introduced from abroad. The existence of this expertise greatly enhances the ability of a developing country to adopt and apply nuclear techniques, and is in part responsible for the progress made in the past four years. Nevertheless, in order to ensure the continued effective transfer of nuclear technology to developing countries, further efforts are still required to strengthen the latter's scientific infrastructure.

Agriculture

35. Isotope-aided research continues to be used extensively to identify management practices leading to the most efficient use of fertilizer and limited soil water resources in crop production. In addition, studies on biological nitrogen fixation have identified genotypes within legume species with six times the nitrogen fixation of other genotypes; the use of these will lead to significant fertilizer savings. Currently, in response to gross soil degradation and erosion and to the serious shortages of fuelwood in many countries, the management of nitrogen fixation by tree species used in agroforestry is under study, as is the identification of genotypes of crops and trees with high efficiency in water and phosphate uptake and use.

36. The applications of isotopes and radiation in relation to food and agriculture have proved to be varied and effective. The use of radiation to improve crops has resulted in the development of about 1,200 new varieties over the past 25 years.

37. The use of radioimmunoassay techniques for measuring hormones in milk and blood has contributed significantly to increasing the reproductive efficiency of dairy cattle, buffalo and camels in many countries. Ionizing radiation has been used successfully to produce attenuated vaccines against lungworm and other diseases in cattle and sheep; this technology has been transferred to areas of the world where control of this parasitic disease is of economic importance. Immunoassay methods have been developed for the diagnosis of several economically important animal diseases as well as for the serosurveillance of rinderpest in Africa.

38. Cost-reducing technologies (e.g. larval diet processing) related to mass-production of the Mediterranean fruit fly (Medfly) for sterile insect technique (SIT) campaigns have been developed and are now being applied in Mexico and Guatemala. Genetic sexing strains have been developed and are being evaluated for incorporation into Medfly SIT programmes.

39. The Biological Control of Tsetse Fly by the Sterile Insect Technique Pilot Project (BICOT) has been successfully completed, with the eradication of the target tsetse fly species from a 1,500 km^2 agricultural zone in central Nigeria.

40. Isotopic labelling of pesticide molecules is a unique tool for tracing the parent material and its breakdown metabolic products in organisms and the environment. The developing countries are increasingly aware of both the positive and negative effects of pesticide usage, and isotope labelling is increasingly used by university and government laboratories in research on pesticide pollution.

41. Thirty-six governments have approved the use of irradiation for processing one or more food items. Twenty-one of these countries are actually applying the process on certain foods. The practical application of food irradiation was discussed by the International Conference on the Acceptance, Control of and Trade in Irradiated Food, jointly organized by FAO, IAEA, WHO and ITC-UNCTAD/GATT, in December 1988 at Geneva. The Conference, attended by delegations from 57 Member States including senior policy-making personnel, adopted by consensus an "International Document on Food Irradiation" 5/ which outlines steps to be taken to facilitate further acceptance, control of and trade in irradiated foods.

Biology and Medicine

42. Diagnostic applications of radionuclides have spread so widely and in so many different areas of medicine in recent years that, along with the therapeutic uses, they have come to be recognized as a separate discipline of medicine called nuclear medicine. A large number of in vivo applications relate to imaging of various internal organs. Instruments have become more complex and sophisticated, with computer control and data analysis incorporated. A variety of new radiopharmaceuticals, especially those produced in cyclotrons, has made it possible to study the functions of the brain and heart in various novel ways. In the transfer of this technology

5/ A number of Member States (18) expressed their views on the document, stating either endorsement or reservation. Their statements are contained in the proceedings of the Conference.

to developing countries, special efforts are needed in connection with the quality assurance of the diagnostic methods. A trained cadre of specialists is required for this quality control and for equipment maintenance.

43. In vitro applications of radionuclides, such as radioimmunoassay and related procedures, are now possible for hundreds of biologically important substances, and measurements of infinitesimally small amounts in circulation have brought about a virtual information explosion in physiology and endocrinology. In recent years these assays have been increasingly applied to the diagnosis of communicable diseases by detecting the presence of antigens or antibodies. To ensure that this technology is widely applied in the developing countries, it is necessary to have a concerted regional effort to produce the reagents indigenously.

44. Ionizing radiation is increasingly accepted for the sterilization of medical supplies and tissue grafts. The microbicidal effect of such intense exposure is also used for rendering sewage sludge innocuous. Advances in radiobiological research have improved the nature and the quality of the radiotherapy of cancer. The computer is now often used to plan radiotherapy for individual patients. Brachytherapy methods have become more effective than before.

45. The use of radiation for cancer treatment is widespread and growing. Accurate dosimetry is essential. Recognizing that the number of national laboratories which can maintain accurate "primary" standard measurement instruments is very small, the Agency has established, in co-operation with WHO, a network of Secondary Standard Dosimetry Laboratories (SSDLs). Participating national laboratories can determine the accuracy of their own instruments against the primary standards. For countries without an operational SSDL, the Agency's laboratory provides calibration services on request. In addition, IAEA and WHO operate a "postal dose intercomparison service". Another service, the international high-dose assurance service (IDAS), performs checks for irradiation facilities, e.g. for food preservation and sterilization of medical products.

46. Nuclear analytical techniques and isotope tracer studies are finding an increasing number of important applications (together with complementary non-nuclear techniques) in human nutritional and health-related environmental studies. Interest continues to focus on the role of minor and trace elements that are essential for good health, as well as on assessing environmental contamination associated with toxic heavy metals and fallout radioactivity. An expansion is foreseen in applications of stable isotope tracers as a result, in part, of the fact that they do not involve any kind of radiation hazard.

Industry and Hydrology

47. Systematic efforts directed towards the promotion of the industrial applications of radioisotopes and radiation technology, in both industrialized and developing countries, have helped to establish the industrial use of nucleonic control systems, the use of nuclear analytical methods in mineral exploration, and the industrial use of large radiation sources. Furthermore, tracer technology has become widely adopted and radioisotopes are produced in large amounts in many countries.

48. Isotope and radiation applications have become commonplace in a number of industries. They are used in such diverse activities as wear and corrosion studies, non-destructive testing, sterilization, improvement of polymer-based products, on-line control and the exploration and recovery of minerals. A recent market survey has shown that the annual value of irradiated products in industry has already reached US$ 2 billion. Several developing countries are employing isotope and radiation techniques, and it is anticipated that their use in other developing countries will increase rapidly.

49. Hydrology techniques involving the use of radioactive isotopes, either intentionally injected into or already present in the environment, are today employed for a variety of water movement studies of particular importance to countries in arid zones. They are also used for new studies relating to waste disposal and geothermal energy. However, relatively few developing countries have at present the scientific infrastructure and trained personnel to apply these techniques.

Research and Training

50. With very few exceptions, nuclear science laboratories have been established in many developing countries. The extent of training in applied and fundamental nuclear science varies in quality and quantity, and is mainly oriented toward practical applications. More than forty developing countries now operate one or more national nuclear research centres, others have incorporated their nuclear science research into the programmes of universities and other teaching institutions. The activities are mainly focused on the application of radioactive isotopes, on the development and use of nuclear analytical techniques, and to a smaller extent on accelerator technology and applications. In many countries, training remains one of the main components of nuclear activities and is frequently combined with applied research. The techniques that are being exploited are based on nuclear spectroscopy of gamma-, beta-, alpha-, and x-rays and on the utilization of special techniques such as Mössbauer spectroscopy and positron annihilation.

51. In view of the complexity of nuclear techniques, the introduction and improvement of training methods in nuclear sciences represent a major effort, and are being implemented on an academic level at universities and in nuclear laboratories.

52. In 1988, there were 326 research reactors in operation in 55 Member States, 71 of these reactors were in 34 developing countries. These reactors represent an important resource for the training of scientists and engineers, for the production of radioisotopes, and for research in basic nuclear physics and chemistry. They are thus an important component of the infrastructure needed for the introduction of nuclear power in many countries.

53. The development of nuclear fission and fusion reactor technologies, as well as the implementation of nuclear methods and techniques in science and industry, has created a growing demand for extensive files of easily accessible nuclear and atomic data, and for computer programs for their processing and utilization. An extensive network of national and regional data centres was established by the Agency to exchange, evaluate and validate the data so as to improve their availability, accuracy and reliability, and to make this body of information available to scientists and engineers in all Member States. With particular emphasis on the needs of developing countries, the data dissemination service is complemented through national and interregional technical cooperation projects and training courses. These are specifically aimed at transferring the technology of nuclear data measurements, providing the necessary training to perform accurate and reliable nuclear research, and at applying this expertise to national nuclear projects.

NUCLEAR SAFETY AND RADIATION PROTECTION

54. The continued transfer of nuclear technology is dependent on a consistently high level of nuclear and radiation safety everywhere. While nuclear safety is primarily a national responsibility, the nuclear energy community has become increasingly aware of the benefits of co-operation and shared experiences, putting into place a wide range of measures to prevent accidents and promote the reliability and safety of all nuclear technologies. The IAEA is the instrument by means of which international co-operation on matters of safety has been promoted and implemented for three decades. Recently, international co-operation on operational safety matters was further enhanced through the memorandum of understanding signed by the Agency and the newly established "World Association of Nuclear Operators (WANO)".

(a) The Internationalization of Nuclear Safety

55. The accident at the Chernobyl plant in 1986 highlighted the need for international co-operation in nuclear power plant safety and the necessity to strive for the highest levels of safety at all plants everywhere. Four months after the accident the Agency held a post-accident review meeting which documented how the accident had occurred. Subsequently the Agency has strengthened its safety evaluation and information exchange services for nuclear power plants and research reactors. The Operational Safety Review Teams (OSART) are perhaps the most visible of these expanding programmes. Since the programme began in 1983, international teams of some 250 safety specialists have been invited to visit plants in 22 countries, of which seven are developing countries, and to explore with the people involved how operational safety can be brought to an even higher level. Teams of experts from Member States and IAEA staff, together with observers from developing countries, have provided impartial international reviews of operational safety in key areas. Analyses of the generic findings of all OSART missions to date are documented. The Engineering Safety Review Service (ESRS), the most recent addition, is being developed to bring requested international experience to the process of reviewing safety issues associated with siting and design of nuclear power plants.

56. Member States are showing increasing interest in safety issues related to ageing reactors, and national reviews have been launched in several countries to reassess the safety of operating WWER-440 reactors of the first generation. The Agency has initiated an extrabudgetary nuclear safety project, within the framework of an international programme, that draws on its central position and expertise to co-ordinate these national studies and provide international consistency.

57. The Assessment of Safety Significant Events Teams (ASSET) programme responds to requests for assistance in learning more about the underlying causes and prevention of incidents with significant safety implications. ASSET missions have been conducted in Brazil, German Democratic Republic, Pakistan, the USSR and Yugoslavia. To foster feedback of operational experience worldwide, the Incident Reporting System (IRS) facilitates an international exchange of information about nuclear power incidents and malfunctions.

58. Research reactors serve the needs of the scientific community in a wide range of applications, including isotope production, materials testing, neutron beam physics experiments, activation analysis and criticality experiments. For more than 15 years the Agency has been assisting Member States to enhance the operational safety of research reactors. A formalized programme of Integrated Safety Assessment of Research Reactors (INSARR) exists under which, since 1981, expert missions have reviewed the operational safety of 50 research facilities in 23 countries. To date, the 326 research reactors operating in 55 countries have a cumulative operating experience of 9800 reactor-years, with an impressive record of safety. Assessments are conducted periodically at research reactors set up with Agency assistance and also upon request.

59. The Nuclear Safety Standards (NUSS) Programme recently revised the five Codes of Practice for the first time since they were begun over a decade ago, to reflect current thinking and experience gained in accident prevention and management. The revised Codes cover the essential safety aspects of governmental organization, siting, design, operation and quality assurance. The Codes are supplemented by 55 Safety Guides recommending how these safety requirements could be implemented. Although the Codes are not binding, Member States have used them extensively to elaborate national regulations and several Member States have directly adopted the Code for Quality Assurance.

60. In 1985, the International Nuclear Safety Advisory Group (INSAG) was established to advise the Director General on nuclear safety issues of international significance. The Group participated in the Post Accident Review Meeting, which the IAEA convened in Vienna in August 1986 to receive authoritative reports from Soviet specialists on the Chernobyl accident, and to solicit recommendations from the nearly 500 international experts in attendance on how nuclear safety could be further improved worldwide. As a follow-up, INSAG studied the reasons for and the international implications of the accident, preparing the IAEA official report on the meeting. In 1988, INSAG pioneered in elaborating a coherent safety philosophy. The recently issued INSAG report entitled "Basic Safety Principles for Nuclear Power Plants" (INSAG-3) reflects the most advanced policies and practices being pursued at nuclear power plants in areas of siting, design, construction, commissioning, operation, accident management and emergency response.

(b) Radiation Safety

61. In 1988, two Agency-sponsored international conferences on radiation protection issues, emphasized the importance the Agency attaches to promoting the safe use of nuclear techniques. At the first gathering, the International Conference On Radiation Protection in Nuclear Energy held in Australia, some 350 experts from nearly 60 Member States and 6 international organizations discussed radiation protection principles and policy issues. The proceedings were published in 1989. A post-accident review meeting held in Rio de Janeiro served as a timely forum for more than 20 experts from 11 countries and 3 international organizations to examine the causes and consequences of the 1987 radiological emergency in Goiânia, Brazil. As a follow-up, the Agency published a report on the lessons learned about accident prevention and management.

62. In the immediate period after the Chernobyl accident turmoil existed in many countries about how to protect the public from contamination. The international community recognized the need for commonly understood facts. The IAEA, therefore, intensified its collaboration with WHO, FAO and other organizations aimed at achieving a more uniform approach to the setting of derived intervention levels, particularly for foodstuffs. As a result, guideline exemption levels for the radionuclide contamination of food moving in international trade were adopted at the 1989 July session of the Codex Alimentarius Commission.

63. In March 1990, the Agency with the participation of the Commission of the European Communities, FAO, UNSCEAR and WHO, began an international project on the radiological consequences of the Chernobyl accident in the affected areas of Byelorussian SSR, Ukranian SSR, and the Russian FSSR. The project, which involves some 100 experts, will assess the health and environmental effects and evaluate protective measures taken by the Government of the USSR. The Agency will publish the final report, prepared by the International Advisory Committee. The project follows a request made in 1989 by the Government of the USSR for Agency organized international assistance.

64. At a 1988 IAEA/NEA meeting in Vienna, an international consensus was achieved on the exemption of radiation sources and practices from regulatory control. The exemption principles are described in IAEA Safety Series No. 89, issued in 1988.

65. Recent radiological accidents and the resulting injuries and fatalities have highlighted problems that can arise when sealed radiation sources are not properly controlled. For many developing countries, the problem of using radiation sources safely is particularly challenging. An ongoing programme addresses the problems of source control and also the management of sources no longer in use. Work progresses on developing useful guidance on the safe handling of radiation sources, which will be useful in assisting Member States to implement safe radiation protection practices.

66. As part of its efforts to assist in the medical management of radiation emergencies, the Agency published in 1986 a technical document entitled "What the General Practitioner Should Know about Medical Handling of Over-Exposed Individuals", and in 1988 a report entitled "Medical Handling of Accidentally Exposed Individuals" (Safety Series No.88).

(c) Radiation Protection Services

67. For many countries using ionizing radiation in various ways, effective radiation protection is especially challenging. Many countries lack the necessary infrastructures for implementing a policy based on international recommendations.

68. Member States are showing increasing interest in co-operative programmes that employ teams of international experts to advise on ways of strengthening national radiation protection infrastructures. Since 1986, Radiation Protection Advisory Teams (RAPATs) have been invited to review infrastructures in 45 countries, and to advise on long-term strategies for assistance and co-operation in the use and control of ionizing radiation tailored to the countries' priorities and needs.

69. In line with RAPAT recommendations, regional projects are under way for several Member States which have common needs for assistance in strengthening their radiation protection infrastructures. In view of the similarity of environmental conditions in Arab Middle East countries, work continues on developing regional capabilities for radiological environmental monitoring. Earlier assistance has resulted in the development of a monitoring system, a network of air contamination monitors, and a food contamination control system for joint use in the region.

(d) Probabilistic Safety Assessment

70. In the area of probabilistic safety assessment (PSA), the Agency continues to play a role in facilitating information exchange, advancing the PSA methodology, and assisting Member States in the use of PSAs. When properly performed, a PSA can yield information useful for design modifications, changes in technical specifications, plant monitoring, licence renewals, operator training and risk management. In 1989, an International Peer Review Service (IPERS) was initiated to assist national authorities in enhancing the effectiveness of PSAs for safety studies. Missions have been carried out to China, the Netherlands, Sweden and the USSR.

71. The Agency personal computer software package (PSAPACK), an integrated event and fault tree package for PSA usage has been distributed to more than 50 users in regulatory bodies, research institutions and utilities in Member States. The reliability database included in PSAPACK has been published in an Agency Technical Document (TECDOC 508). The package is being adapted for use as a tool for operational safety management of nuclear power plants, in co-operation with Member States. The co-ordinated research programme on the comparison of the cost effectiveness of risk reduction among different energy systems drew to a close in 1988. The programme, which included more than 30 case studies carried out by 15 Member States, demonstrated the practicality of this methodology for risk reduction analysis.

(e) International Conventions and Emergency Response

72. As regards the Agency's obligations under the conventions on Early Notification of a Nuclear Accident and on Assistance in the Case of a Nuclear Accident or Radiological Emergency (see paragraph 154), on 18 January 1989 the Emergency Response System of the Agency was formally put into operation. In 1987, the response to the radiological emergency in Goiânia, Brazil, was the first example of the emergency assistance convention in action. It demonstrated the importance of having an international focal point that Member States can turn to for assistance.

RADIOACTIVE WASTE MANAGEMENT

73. In the period 1985–1990, waste management problems of developing countries received high priority and a special service called the Waste Management Advisory Programme (WAMAP) was established. Under WAMAP, the national radioactive waste management policies, plans and activities of 23 developing countries have been reviewed. In addition, special attention has been given to the problems of the control and safe management and disposal of sealed sources.

74. In 1989, pursuant to a request by the Agency's General Conference, the Director General established a representative technical group of experts with the objective of elaborating an internationally agreed code of practice for international transactions involving nuclear wastes.

75. Since 1978, the Agency has been guided in its programme in the underground waste disposal area by the Technical Review Committee on Underground Disposal (TRCUD). Around thirty Safety Series reports have been issued on all important safety aspects of underground waste disposal. The TRCUD was replaced in 1988 by a new committee, the International Radioactive Waste Management Advisory Committee (INWAC), which will provide advice to the Agency on the whole of its radioactive waste management programme. At the same time a new document series, the Radioactive Waste Safety Standards (RADWASS), is being introduced with the object of bringing greater focus to the recommendations of the Agency on safety in waste management.

76. Problems exist in many Member States over the public perception of radioactive waste issues. The Agency is preparing a "source book" on the subject of radioactive waste management, which is intended to aid authorities in Member States responsible for preparing public information documents, and for responding to questions about radioactive wastes.

77. Work was started on a radioactive waste management database with the aim of providing a ready source of reliable information on the status of radioactive waste management in Member States.

78. In the period 1985–1990, the Agency organized two symposia in the radioactive waste management area. The first on "Siting, Design and Construction of Underground Repositories for Radioactive Wastes" was held in 1986 in the Federal Republic of Germany, and the second on "Management of Low- and Intermediate-Level Radioactive Wastes" was held in 1988 in Sweden. The proceedings of both symposia have been published.

79. In the waste management area, the Agency is currently providing support for 26 technical co-operation projects in 19 Member States, which cover the whole waste management spectrum, and reflect the main current concerns of developing countries on handling, treatment, conditioning and storage.

(a) Handling, treatment, conditioning and storage of radioactive wastes

80. Work on a new series of short technical manuals offering practical guidance on the treatment, conditioning and storage of the various types of radioactive waste which can be generated from applications in research, medicine and industry has been started. A video film illustrating methods for the conditioning and storage of certain types of sealed sources has been prepared for use in training courses and lectures, and presentations during WAMAP and technical co-operation missions.

81. Training courses have been organized on a regular basis to answer the needs of Member States in the waste management area. Recently they have tended to be directed more to the practical problems of handling, treatment and storage of wastes from the medical, research and industrial uses of radionuclides.

(b) Underground radioactive waste disposal

82. In 1989, the Agency published a report in the Safety Series, Safety Standards category, entitled "Safety Principles and Technical Criteria for the Underground Disposal of High Level Radioactive Wastes" (Safety Series No.99).

(c) Decontamination and decommissioning of nuclear facilities

83. This programme consists of three components: guidance on the decontamination and decommissioning of nuclear installations; the management of uranium mill tailings; and the cleanup of large areas after a nuclear accident.

84. Decontamination and decommissioning are becoming increasingly important as nuclear power stations in industrialized countries reach the end of their useful lives. The Agency's programme has focused on providing a forum for the exchange of information on technology and technique development. Several reviews of the state-of-the-art in various aspects of the subject have been published, and a co-ordinated research programme has been organized.

85. Each year about 50,000 m^3 of uranium mine and mill tailings are produced for each 1000 MW(e) reactor in the world. In 1987, the Agency published a Safety Standard on the Safe Management of Wastes from the Mining and Milling of Uranium and Thorium Ores. Some questions still remain to be answered on the most suitable practical methods for ensuring the long-term safety of mill tailings piles, and the Agency has supported research on the behaviour of radium and other elements in these environments. A monograph was issued on the subject in 1989. In addition, the most recent development in the technology for the close-out of mill tailing facilities has been summarized in an Agency report.

86. In 1986, following the Chernobyl accident, the Agency was requested to review and summarize available information on the clean-up of large areas after nuclear accidents. A comprehensive set of reports has been produced covering overall operational planning, techniques for monitoring and decontamination, and the transport and disposal of the resulting wastes.

(d) Environmental aspects of radioactive waste management

87. In 1986, the Agency issued a revised version of its Definition and Recommendations related to the marine disposal of radioactive wastes as a Safety Standard (Safety Series No. 78). This version, which was formally accepted by the London Dumping Convention, is the internationally accepted code for marine disposal of radioactive wastes. The Agency is keeping this subject under continuous review, and a revision of the Safety Standard to reflect improvements in environmental knowledge and changes in the area of radiation protection will be considered in the early 1990's.

88. As an aid to the parties to the London Dumping Convention in their review of the current moratorium on sea-dumping of radioactive wastes, the Agency has undertaken to assist in answering a number of questions concerned with the risks of marine disposal as compared to other types of risk.

89. A co-ordinated research programme on the validation of models for the transfer of radionuclides in terrestrial, aquatic and urban environments was started. It will utilize the environmental information which became available following the Chernobyl release for the purpose of improving the reliability of environmental transfer model predictions.

90. Reports are being prepared on the application of exemption principles to the recycle of slightly contaminated materials from the fuel cycle, to consumer products containing small radioactive sources, and to low level wastes from the use of radionuclides in hospitals and research establishments.

CONTRIBUTION TO SUSTAINABLE DEVELOPMENT

91. In the United Nations General Assembly resolutions 42/187 and 42/186, the report of the World Commission on Environment and Development was welcomed and the Environmental Perspective to the year 2000 and Beyond was adopted.

92. In these resolutions, the General Assembly, inter alia, called upon the governing bodies within the United Nations system "to review their policies, programmes, budgets and activities aimed at contributing to sustainable development", "to take account of the analysis and recommendations contained in the report of the World Commission in determining their policies and programmes", and "to report regularly to the General Assembly on the progress made in achieving the objecties of environmentally sound and sustainable development....".

93. At its thirty-second regular session, the Agency's General Conference (resolution GC(XXXII)/RES/494) requested "the Director General to submit to the Board of Governors in February 1989 information on the contribution of the Agency's programme activities towards achieving the objectives of environmentally sound and sustainable development as a basis for a report to be submitted to the forty-fourth session of the General Assembly". The Board of Governors discussed this matter and a report was submitted to the United Nations Assembly (Annex IV: The International Atomic Energy Agency's Contribution to Sustainable Development; Nuclear Energy and the Environment May 1989).

94. "IAEA's activities address many of the conclusions and recommendations made by the World Commission. To the extent that these lie within the Agency's statutory mandate, the IAEA programme has been responding to them for many years. Thus: (a) while focussing on nuclear power as one means of providing energy for economic development, the Agency has developed energy planning techniques that, based on comparisons between different ways of producing electricity, define an economically optimized expansion of electricity systems; (b) a significant part of the Agency's overall programme is the Joint IAEA/FAO programme on nuclear techniques in food and agriculture, which is devoted almost entirely to increasing food production while reducing the environmental impact of fertilizer and pesticide use; (c) nuclear techniques have become routine tools for resource development for example, hydrological investigations for water resource assessment and development are now hardly ever performed without isotope techniques; (d) the supply of energy for economic growth in a sustainable and environmentally acceptable manner is a central activity in the Agency's programme; (e) the Agency encourages environmental monitoring and assessment using techniques as important in the context of the urban and industrial environments.

95. Regarding emergency response in case of a nuclear accident, the IAEA Conventions on Early Notification and on Emergency Assistance are both in force (see paragraph 154).

96. The IAEA programme also includes activities related to other issues raised by the World Commission concerning nuclear energy, namely, the proliferation concern, nuclear energy costs and financing, health and environmental risks, nuclear accident risks and radioactive waste disposal. In total, environmental-related activities account for about 17 per cent of the Agency's regular budget. Within the substantive programme areas, the percentage is much higher: 60 per cent in nuclear energy and safety and 55 per cent in nuclear applications.

MECHANISMS FOR TRANSFER

TECHNICAL ASSISTANCE AND CO-OPERATION

Programme Implementation and Programme Trends

97. Since its establishment in 1957, the IAEA has been promoting peaceful uses of nuclear technology, particularly in developing countries, through its technical co-operation programme. Each year, the budgets of projects aimed at encouraging peaceful and practical applications of radiation and radioisotopes, and of promoting human resource development, are approved by the IAEA's Board of Governors for implementation in roughly 80 developing Member States. Such projects comprise the provision of the services of international experts, the supply of equipment and reagents, the organization of fellowship and group training for developing country nationals, and the furnishing of such other types of support as might be needed for successful technology transfer. The fact that technology transfer is making a genuine impact is evidenced by the increasing number of Agency experts who come from developing countries, and by an ever greater number of training events that take place in the developing regions of the world.

(a) Programme emphasis

98. The field of nuclear technology in which the IAEA is able to provide assistance is broad, covering such varied activities as exploration for uranium, nuclear instrument maintenance and the sterilization of human tissue for skin grafts. Typically, however, most assistance has related to the use of radioisotopes in agriculture, aspects of nuclear power planning and project execution ("engineering"), nuclear safety, nuclear analytical methods, industrial uses of radiation technology and medical applications of radiation and radionuclides. This trend has not changed. Recently, there has been growing interest on the part of all developing Member States in radiation protection. The distribution of assistance by field of activity over the past five years is shown in Figure 1. It should be noted that the focus of the programme is determined by Member States in their requests for assistance from the IAEA and not by the Secretariat.

(b) Programme cycle (see NPT III Final Declaration para.16(vi)).

99. The programme has grown steadily during the past five years, and there has been a considerable increase in multi-year activities. In the light of this development, the Board of Governors, in 1989, approved the IAEA's first two-year technical co-operation programme covering the period 1989-90. The two-year cycle is expected to facilitate programme planning as greater time will be available for project preparation.

Resources and Delivery

(a) Resource category

100. Technical Assistance and Co-operation Fund (TACF). While funds for technical co-operation come from various sources, the most significant funding for the programme is the TACF. In 1980 agreement was reached at the Agency's Board of Governors to place the TACF on the basis of Indicative Planning Figures (IPFs), and in 1981 the General Conference adopted by consensus a Resolution (GC(XXV)/RES/388) requesting the Board of Governors to take steps to make the financing of technical assistance predictable, assured and adequate for the maximum possible number of technically sound projects.

101. For the years 1985 to 1990 the IPFs were: 1985, US$ 26 million; 1986, 30 million; 1987, 34 million; 1988, 38 million; 1989, 42 million; 1990, 45.5 million. The voluntary contributions actually paid by individual Member States for the years 1985 to 31 December 1989 are shown in Annex V.

102. Extrabudgetary funds. Smaller amounts - although by no means insignificant - are made available as extrabudgetary contributions by individual donor countries for particular projects. Such projects - initially approved by the Board of Governors without funding but with proposed budgets, activity schedules and objectives - are implemented whenever additional funds become available. It is in this part of the programme (referred to internally in the IAEA as the footnote a/ programme) that donor countries have the opportunity to select projects of their choice. (For detailed information on footnote a/ projects see Annex VI). Extrabudgetary funds accounted for 14.7% of the total available resources in 1989. (Figures 2 to 5 show the percentage of contributions to and receipts from technical co-operation resources - TACF and extrabudgetary funds - by NPT parties in aggregate).

103. UNDP. The IAEA has, since its inception, been an executing agency for UNDP. In this capacity, it administers projects funded by UNDP that relate to the promotion of nuclear technology. In recent years the proportion of the programme financed by UNDP has been decreasing due to: firstly, the rapid increase of the TACF; and secondly, the lack of means by the Agency (i.e. staff, travel) to seek opportunities to acquire further UNDP projects due to zero-growth. In 1989, UNDP funds accounted for 6.2% of the total available resources.

104. Assistance in kind. For certain of its technical co-operation activities, particularly fellowship training, the IAEA also relies on assistance made available by donors in kind. This category accounted for 4.6% of the total available resources in 1989. (For detailed information on assistance in kind see Annex VII).

105. Programme growth was rapid during the last decade. An amount of US $7.8 million was disbursed from the TACF in support of technical co-operation in 1980; the corresponding figure for 1989 was US $29.3 million, which represents an increase of 276% (see Figure 6). Extrabudgetary resources and disbursements also increased significantly, disbursements rising from US $2.4 million in 1980 to US $6.7 million in 1989. Figure 7 illustrates the growth of the footnote-a/ component of the programme.

(b) Assistance components

106. Figure 8 shows the distribution of assistance by component (i.e. experts, equipment and training). As can be observed from this figure, a significant share of the resources available for technical co-operation is being utilized for the procurement of equipment. The remaining provisions are nearly evenly split between training (both group and individual) and expert services. There has been no departure from this trend in recent years.

Distribution of Assistance

107. The programming of TACF resources is undertaken in accordance with the principle of universality i.e. the distribution of TACF resources is non-discriminatory as regards Member States and geographic regions - and reflects the needs of Member States as indicated in their requests for assistance. Figure 9 shows the distribution of assistance by region since the inception of the technical co-operation programme.

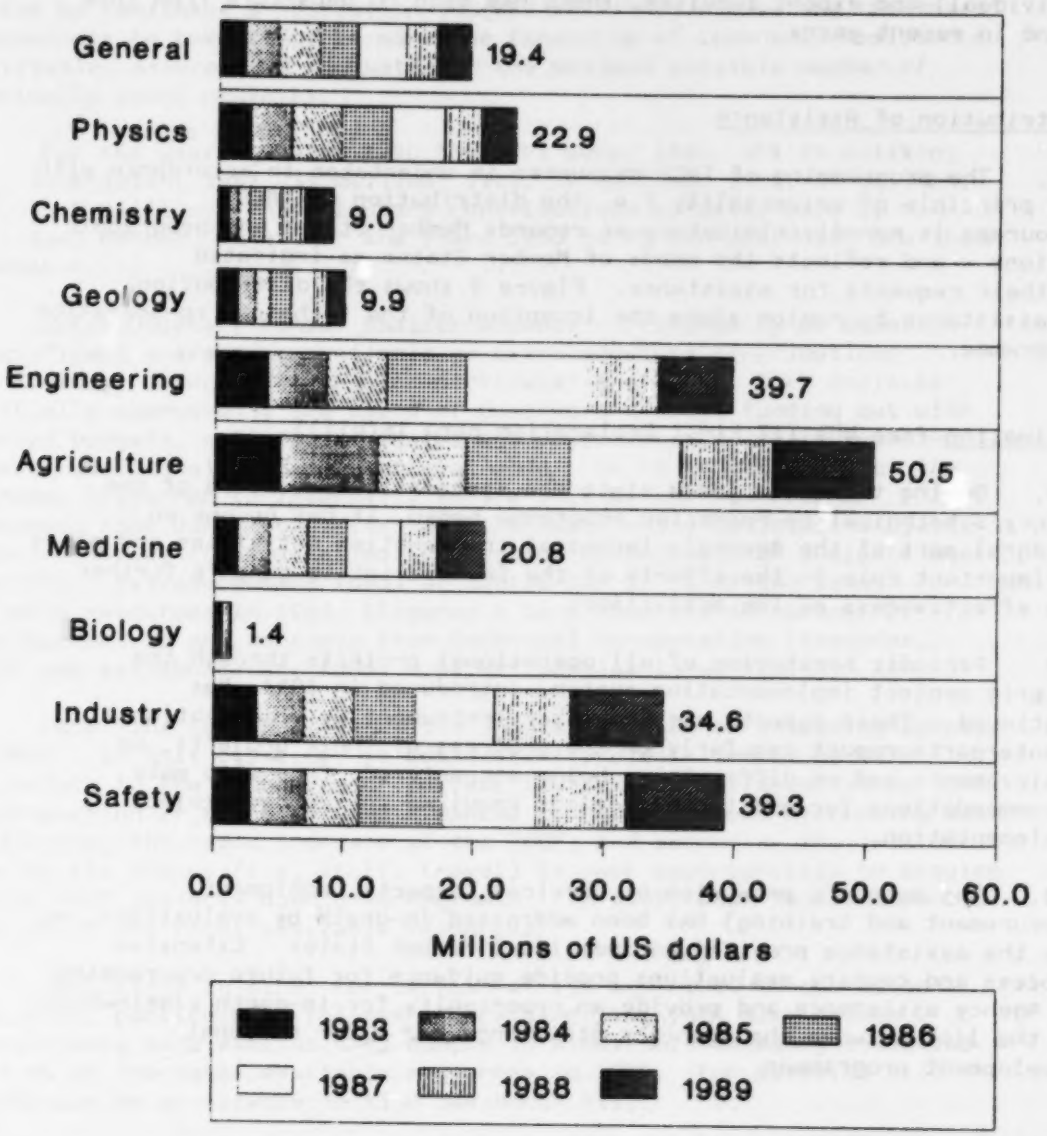
Evaluation (see NPT III Final Declaration para.16(vii)).

108. During the seven years since the systematic evaluation of the Agency's technical co-operation programme began, it has become an integral part of the Agency's technical co-operation activities and plays an important role in the efforts of the Secretariat to enhance further the effectiveness of the activities.

109. Periodic monitoring of all operational projects through the interim project implementation system, introduced in 1984, has continued. These reports are the major instrument by which national counterparts report regularly on the progress of their projects, on achievements and on difficulties being encountered; they also make recommendations for additional actions required to improve project implementation.

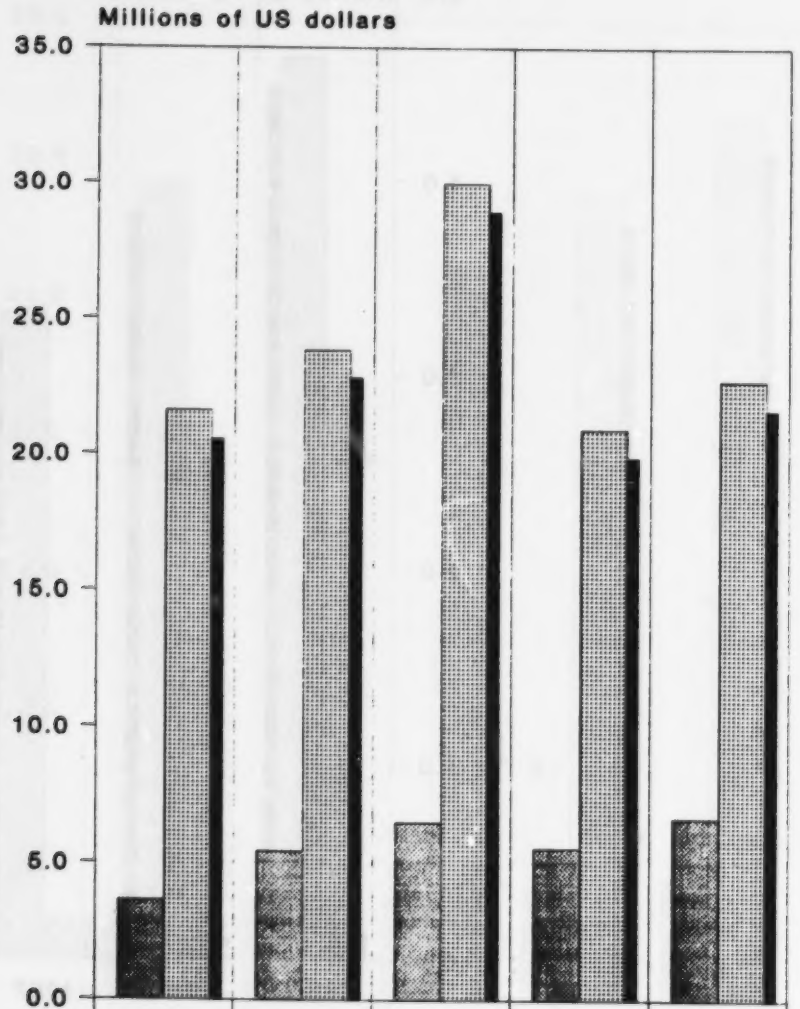
110. The Agency's provision of services (experts, equipment, procurement and training) has been addressed in-depth by evaluations, as has the assistance provided to individual Member States. Extensive process and country evaluations provide guidance for future programming of Agency assistance and provide an opportunity for in-depth examination of the link between the Agency's assistance and wider national development programmes.

FIGURE 1
DISTRIBUTION OF DISBURSEMENTS BY FIELD OF ACTIVITY *



* All sources of funding.

FIGURE 2
DISTRIBUTION OF DISBURSEMENTS FROM TACF BY NPT STATUS*

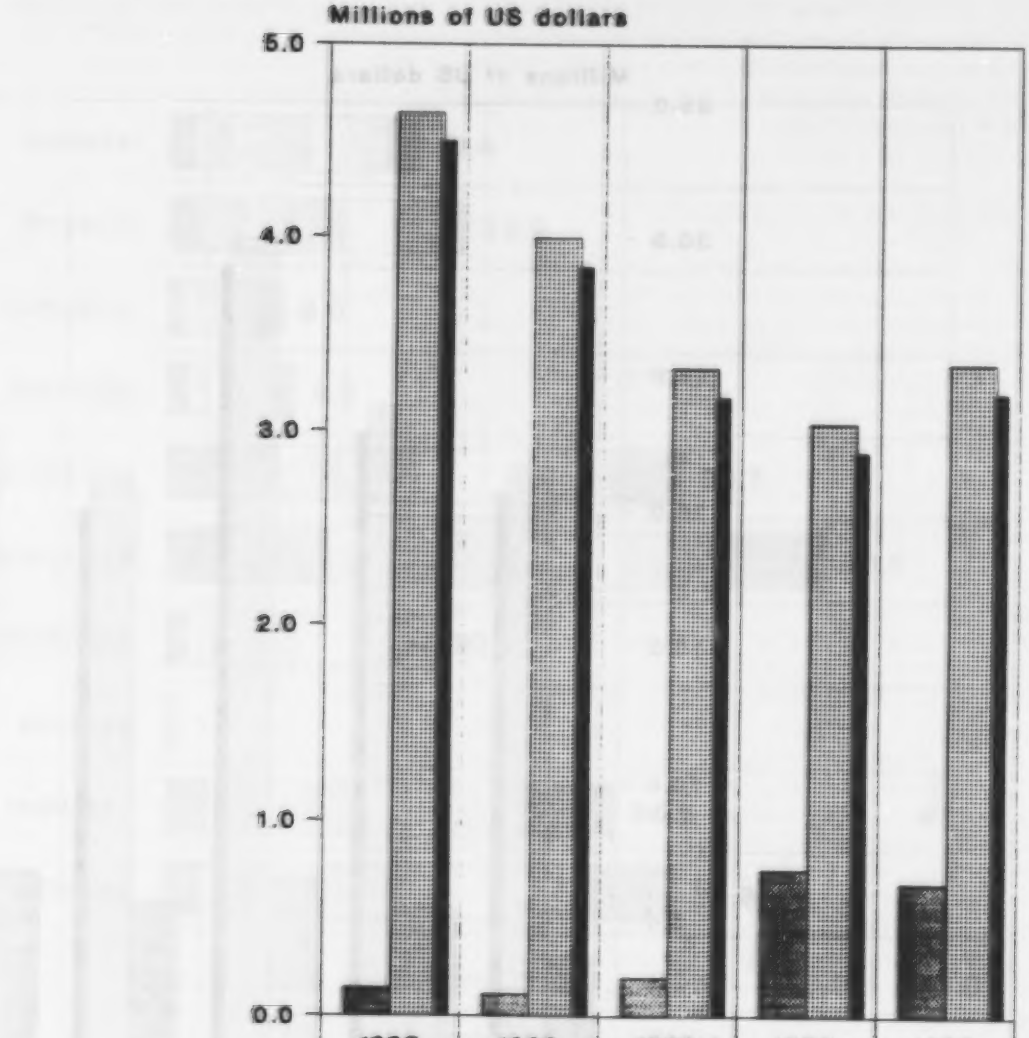


	1985	1986	1987	1988	1989
Non-NPT Parties	3.6	5.4	6.5	5.5	6.6
NPT Parties	21.6	23.8	30.0	20.9	22.7

* All assistance components.

It should be borne in mind that not all parties to the NPT are Members of the Agency. There are 140 parties to the NPT of which 90 are Members of the Agency. The Agency has 113 Member States.

FIGURE 3
DISTRIBUTION OF DISBURSEMENTS FRO
EXTRABUDGETARY FUNDS BY NPT STATU

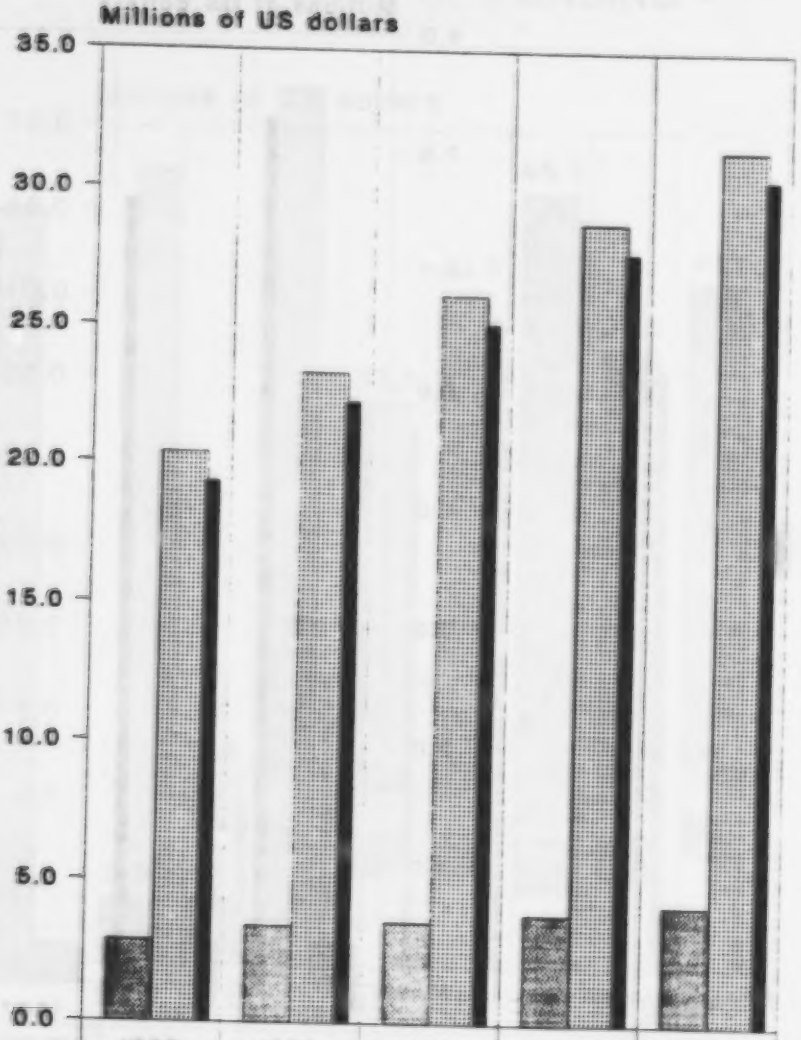


	1985	1986	1987	1988	1989
Non-NPT Parties	0.1	0.1	0.2	0.8	0.7
NPT Parties	4.6	4.0	3.3	3.0	3.3

• All assistance components.

It should be borne in mind that not all parties to the NPT are Members of the Agency. There are 140 parties to the NPT of which 90 are Members of the Agency. The Agency has 118 Member States.

FIGURE 4
TACF PLEDGES BY YEAR AND BY NPT STATUS*

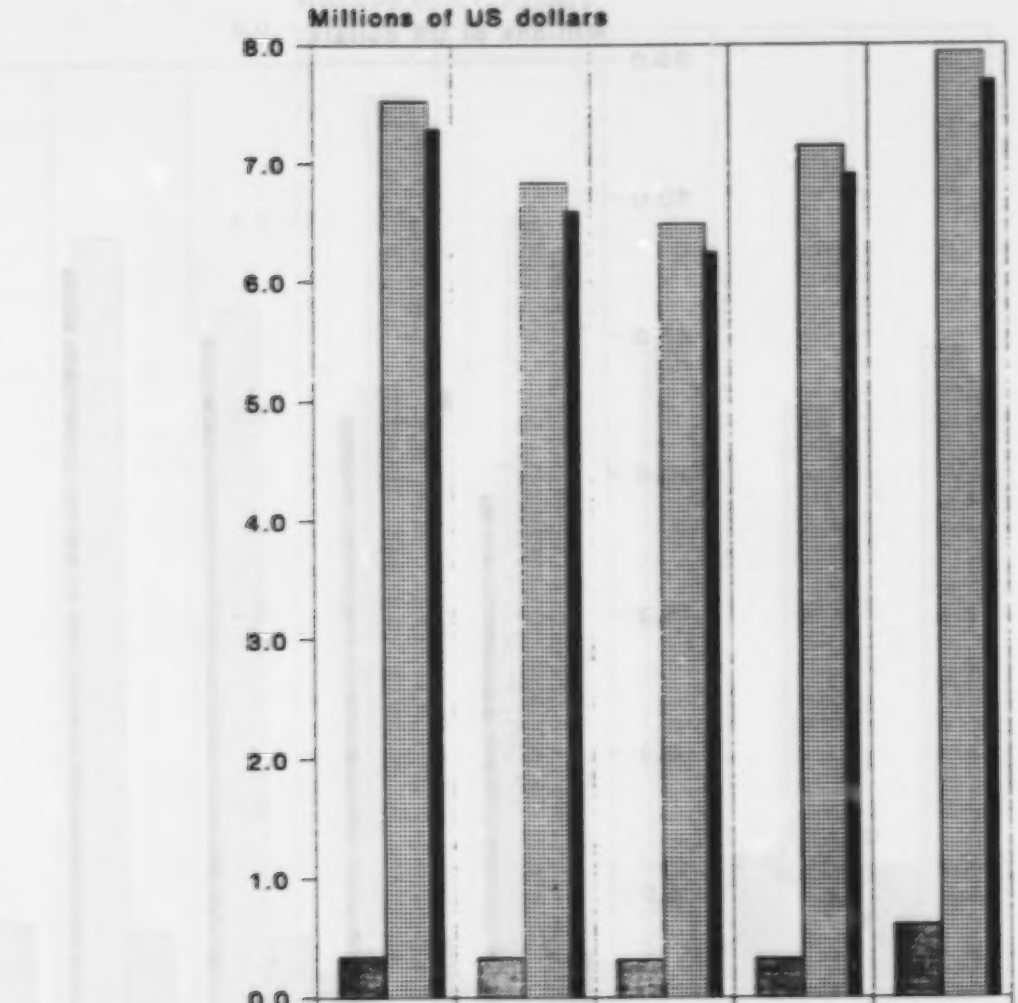


	1985	1986	1987	1988	1989
Non-NPT Parties	2.9	3.4	3.6	3.9	4.2
NPT Parties	20.4	23.3	26.2	28.8	31.5

* As at 31 December of year in question

It should be borne in mind that not all parties to the NPT are Members of the Agency. There are 140 parties to the NPT of which 90 are Members of the Agency. The Agency has 113 Member States.

FIGURE 5
EXTRABUDGETARY AND IN-KIND CONTRIBUTIONS BY NPT/NON-NPT STATUS

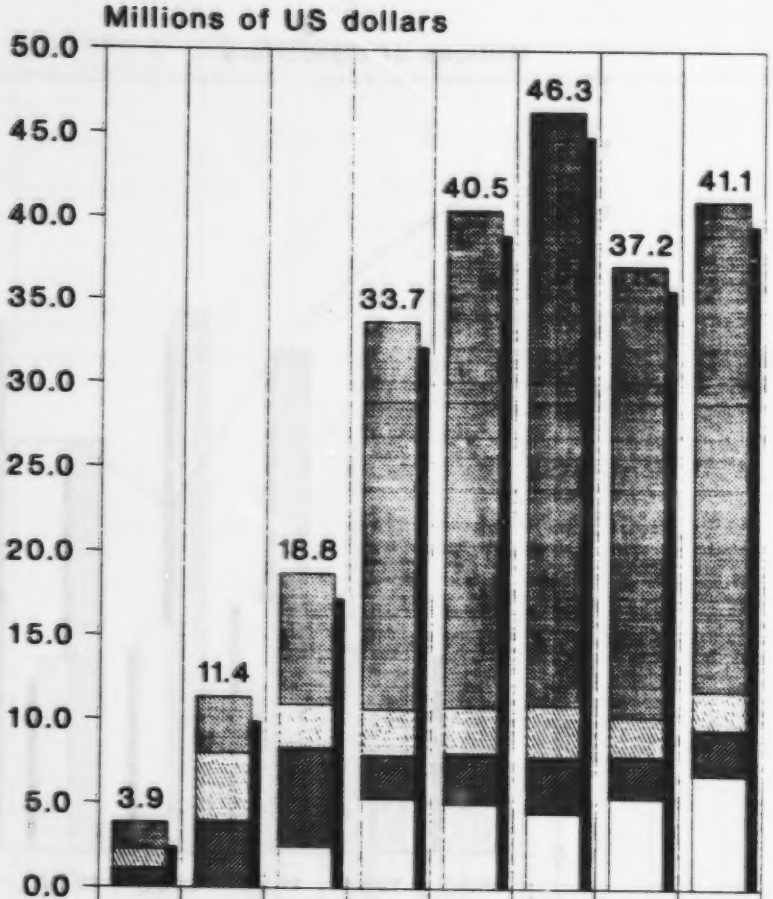


	1985	1986	1987	1988	1989
Non-NPT Parties	0.3	0.3	0.3	0.3	0.6
NPT Parties	7.5	6.8	6.5	7.1	7.9

• Disbursed as at 31 December of the year in question.

It should be borne in mind that not all parties to the NPT are Members of the Agency. There are 140 parties to the NPT of which 90 are Members of the Agency. The Agency has 113 Member States.

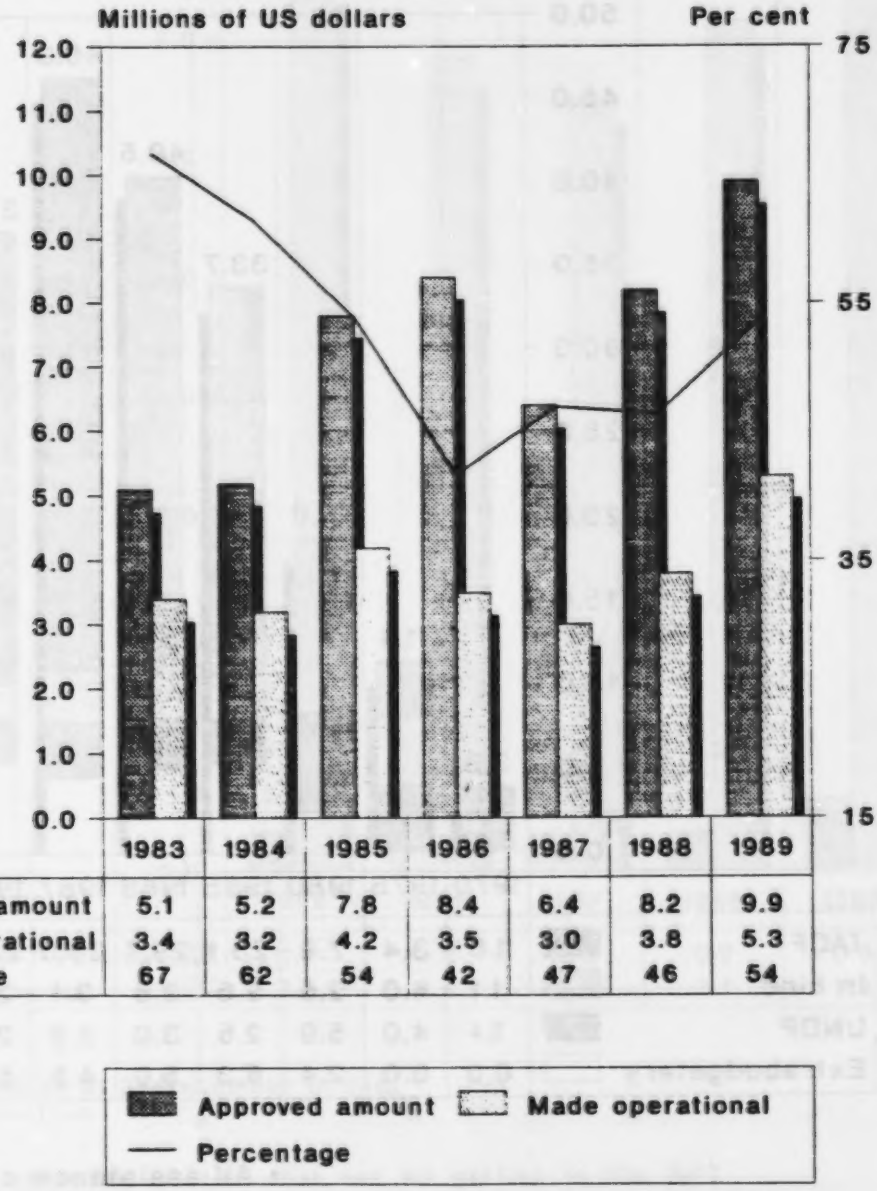
FIGURE 6
DISTRIBUTION OF DISBURSEMENTS BY SOURCE OF FUNDING *



	1970	1975	1980	1985	1986	1987	1988	1989
TACF	1.6	3.4	7.8	23.1	29.7	35.5	27.0	29.3
In kind	1.1	4.0	2.6	2.8	2.8	3.1	2.3	2.3
UNDP	1.1	4.0	5.9	2.6	3.0	3.3	2.5	2.8
Extrabudgetary	0.0	0.0	2.4	5.3	5.0	4.5	5.4	6.7

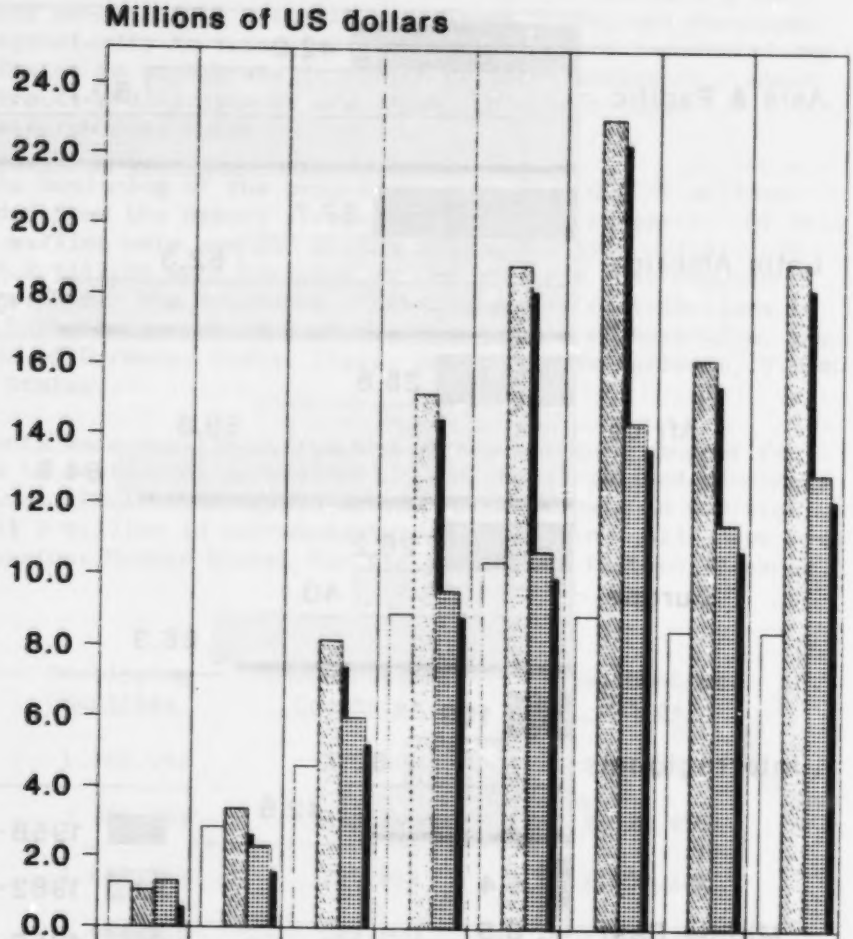
* All assistance components.

FIGURE 7
FOOTNOTE-a/ PROJECTS APPROVED AND MADE OPERATIONAL



	1983	1984	1985	1986	1987	1988	1989
Approved amount	5.1	5.2	7.8	8.4	6.4	8.2	9.9
Made operational	3.4	3.2	4.2	3.5	3.0	3.8	5.3
Percentage	67	62	54	42	47	46	54

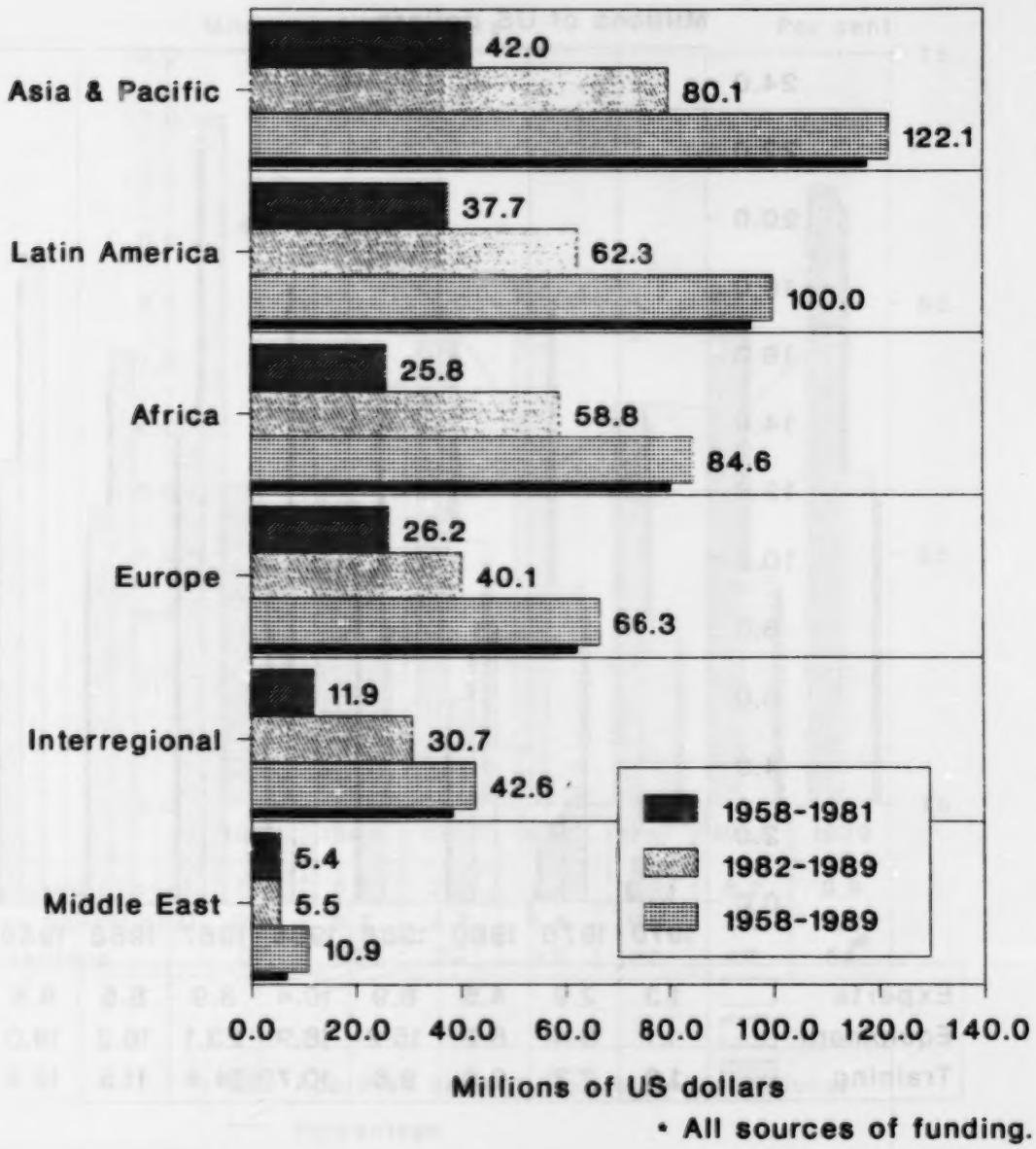
FIGURE 8
DISTRIBUTION OF DISBURSEMENTS BY COMPONENT *



	1970	1975	1980	1985	1986	1987	1988	1989
Experts	1.3	2.9	4.6	8.9	10.4	8.9	8.5	8.5
Equipment	1.1	3.4	8.2	15.2	18.9	23.1	16.2	19.0
Training	1.3	2.3	6.0	9.6	10.7	14.4	11.5	12.9

* All sources of funding.

FIGURE 9
DISTRIBUTION OF DISBURSEMENTS BY REGION *



* All sources of funding.

RESEARCH CONTRACTS AND AGREEMENTS

111. Under its Research Contract Programme the Agency places contracts and agreements with research centres, laboratories, universities and other institutions in Member States for the conduct of research projects in relation to its scientific programmes.

112. The Research Contract Programme, which has been active virtually since the inception of the Agency, has shown great flexibility in addressing the varying needs of Member States. In the mid-1960's the concept of Agency co-ordinated research programmes (CRPs) was developed to provide an opportunity to scientists in developing and industrialized Agency Member States to co-operate in common research endeavors. About 80% of all contracts and agreements are organized within these co-ordinated research programmes.

113. Since the beginning of the programme, more than US$ 35 million have been awarded from the Agency's regular budget for research. Of this amount, US$ 13 million were awarded during the period 1985 - 1988. In addition, US$ 4.3 million were included in the Agency's 1989 regular budget for awards under the programme. Extrabudgetary contributions to this programme have been received from the Governments of Australia, the Federal Republic of Germany, India, Italy, Japan, the Netherlands, Sweden and the United States.

114. The amounts made available from the Agency's regular budget for contract awards to institutes in developing and industrialized countries during the period 1985-1989 are given in the table below. In addition, an estimated US$ 3 million in extrabudgetary contributions will have been received from various Member States for the support of further research in this period.

Award Year	Developing Countries	Industrialized Countries	Total Contract Awards
1985	1,769,192	276,600	2,045,792
1986	1,998,462	276,390	2,274,852
1987	1,842,369	265,833	2,108,202
1988	2,491,915	323,800	2,815,715
1989	2,168,376	322,470	2,490,846
	10,270,314	1,465,093	11,735,407

115. Individual contracts and agreements, and the CRPs in which they participate, are normally undertaken for a period of three to five years. The Agency plays a major role in determining the plan of work and in co-ordinating the efforts of the research teams at various institutes. Co-ordination meetings are arranged for CRPs at appropriate intervals, in order for the chief scientific investigators of each contract and agreement, to exchange ideas and present their project reports.

116. There are currently some 1500 active contracts and agreements participating in over 120 CRPs. The average award received by contract holders is US$ 5,000 per annum, plus travel to research co-ordination meetings. Cost-free agreements are placed with institutes in developed countries. Under such agreements, no financial award is made to the agreement holder other than the provision to attend periodic research co-ordination meetings at the Agency's expense.

117. The results of all research projects are widely available to Member States through Agency publications and publications in recognized scientific journals. The summarized results of these projects are included in INIS. Some co-ordinated research programmes have made significant impacts in such widely varying subjects as hydrology in semi-arid regions, studies of pesticide residues in the tropics, waste management and the integrity of spent nuclear power fuel during extended storage.

INTERNATIONAL NUCLEAR INFORMATION SYSTEM (INIS)

118. INIS is the only bibliographic database covering the world's literature on the peaceful uses of nuclear science and technology. It is based on decentralized national input and centralized (IAEA) processing and distribution. The products distributed are the semi-monthly abstracting journal INIS Atomindex, and a magnetic tape service.

119. During the period 1985-1989, 79 Member States and 15 international organizations participated in INIS, and their combined input to the data base consisted of 1,352,356 records (see table below).

120. The INIS Clearinghouse also provides the full text of so-called "non-conventional" literature (reports, certain conference papers, etc.) on microfiches. In 1985-1989, 2.2 million reports (3.0 million microfiches, which corresponds to nearly 146 million printed pages) were distributed to INIS members.

	1985	1986	1987	1988	1989
Official Participants (Member States + International Organizations)	88(74+14)	88(74+14)	89(75+14)	93(78+15)	94(79+15)
Centres submitting input	63(56+7)	58(51+ 7)	61(51+10)	57(49+ 8)	59(51+8)
Number of items received	84 042	91 301	101 218	102 058	92 676
Number of non-conventional literature documents available	13 776	13 053	12 053	15 219	11 645
Number of subscriptions to INIS Atomindex 6/	1 037	873	828	740	635
Number of Member States direct access utilizing to INIS database 6/	28	28	33	28	27

6/ Establishment of national on-line services and financial strictures have resulted in less use of hardcopy publications and of the on-line service from Vienna in favour of national on-line services.

REGIONAL CO-OPERATIVE AGREEMENTS AND CO-OPERATION ARRANGEMENTS
(see NPT III Final Declaration para.16(v))

Asian Regional Co-operative Agreement for Research, Development and Training related to Nuclear Science and Technology (Asian RCA)

121. The Asian RCA entered into force on 12 June 1972, and was renewed in 1977 and 1982. A new RCA Agreement was negotiated in 1987. Its principal aim is to promote and co-ordinate research, development and training projects in nuclear science and technology through appropriate national institutions. There are currently fourteen RCA Member States: Australia, Bangladesh, China, India, Indonesia, Japan, Republic of Korea, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, Thailand and Viet Nam.

122. The aims of RCA are pursued through the support of regional projects in the fields of the industrial applications of isotopes and radiation technology, the medical and biological applications of nuclear techniques, food and agriculture, and energy and nuclear power planning.

123. In the period 1985-1989, RCA budgets have been growing at the rate of 30% annually, which is about four times the rate of growth of the technical assistance budgets as a whole. In 1989, the budget for RCA projects amounted to US$ 3.13 million, from which 75% was to be funded from UNDP and extra-budgetary resources. Major contributions have traditionally been made by Australia and Japan. In 1983, India began contributing to RCA as a donor. This was followed by the Republic of Korea and the People's Republic of China. In 1989, the Asian Development Bank foreshadowed a major contribution to a Regional Training Course. The Agency supports a number of co-ordinated research programmes through the regular budget, and regional Asian technical assistance projects through the voluntary fund.

124. A feature of RCA is the extent to which individual institutes working with the Agency's technical experts accept a special responsibility for implementing particular projects. Examples include the Japan Atomic Energy Research Institute; the National Institute of Radiological Sciences in Japan; the Australian Nuclear Science and Technology Organization; the Royal Prince Alfred Hospital and the Julius Krutschnitt Mineral Research Centre in Australia; the Bhabha Atomic Research Centre, India; the Korea Advanced Energy Research Institute, Republic of Korea; BATAN, Indonesia; and the Shanghai University of Science and Technology, China.

125. Ultimately, RCA must be judged by the contribution the programme has made to the development of Member States. The impact has been widespread. In the field of agriculture, for instance, a total of 64 mutant varieties of grain legumes have been introduced to six developing countries. A successful campaign has been waged against a parasitic infection in Sri Lankan buffalo calves which at one time infected 20 to 40 per cent of the population. This would not have been possible without knowledge of the life-cycle worked out using radioactive tracer techniques. In the field of medicine a major step has been made towards

improving the diagnosis of liver diseases in developing countries with the publication of an Atlas of Liver Images. In the area of the radioimmunoassy of thyroid hormones, it has been found possible to reduce the cost of a patient investigation by up to a factor of 10 by introducing the bulk reagent methodology. This has led to a large documented increase in the number of patients examined and the approach will be extended to hepatitis B.

126. The UNDP Regional (RCA) Industrial Project has resulted in significant industrial investment in radiation sterilization, radiation cross-linking and nucleonic control systems technology. In addition, efforts are continuing towards the regional harmonization in the certification of NDT qualified personnel. Underlying the total programme is a major project supported by three Member States to strengthen national radiation protection infrastructures.

African Regional Co-operative Agreement for Research, Development and Training related to Nuclear Science and Technology (African RCS).

127. In September 1988, representatives of African Member States met during the thirty-second regular session of the General Conference to discuss ways and means of intensifying regional co-operation in the utilization of nuclear techniques for development. As a result of the meeting, a working group was established to develop the text of a regional co-operative agreement for consideration by African Member States, similar to the arrangements already in place in the Asian and Latin American regions. The text so developed was considered, and finalized, during the General Conference's thirty-third regular session at two meetings of representatives of African Member States. The Board of Governors endorsed the Agreement at its session of February 1990 and three countries have now acceded to it (see paragraph 152). Other countries are in the process of endorsing it. It has been agreed that the inaugural meeting of the AFRA project will be held in Cairo in August 1990.

Regional Co-operation Arrangements for the Advancement of Nuclear Science and Technology in Latin America (ARCAL)

128. ARCAL began in September 1984. It is a co-operative effort which facilitates technical co-operation within countries in Latin America by sharing facilities, equipment and human resources. ARCAL fosters self-sufficiency in several areas of applied nuclear technology to contribute toward social and economic development of its Member States. The following countries are members of ARCAL: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, Guatemala, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela.

129. Regional projects are being implemented in the fields of radiation protection, nuclear instrumentation, radioimmunoassay in animal reproduction, nuclear analytical techniques, research reactor utilization, food irradiation, improvement of cereals through mutation breeding, radioimmunoassay of thyroid-related hormones, nuclear information, application of isotope techniques in geothermal resources exploration, and application of isotope techniques in hydrology.

130. During the past four years the budget for ARCAL has grown continuously, and for 1989 it amounted to approximately US$ 2.9 million. Of this amount, some US$ 1.2 million came from the Agency, which supports a number of co-ordinated research programmes through the regular budget, and several activities of the different projects through the Technical Assistance and Co-operation Fund. An equal amount came from in-kind contributions of Latin American countries participating in ARCAL. Half a million dollars came from extra-budgetary contributions of donor countries or agencies. The main contributors have been France, the Federal Republic of Germany, Italy, the United States and the European Economic Community.

131. A very strong component of the ARCAL programme has been training. In 1989, 80% of the activities planned corresponded to courses or similar training events.

132. Through ARCAL it has been possible to train hundreds of scientists in the region. Most of the experts required for the implementation of the projects come from Latin American countries. Some achievements of ARCAL are: a network of laboratories to provide preventive maintenance of nuclear instruments; initiation of production of some radioimmunoanalysis reagents; a good mutual understanding among the nuclear establishments in Latin America.

133. In 1983, a regional project outside the ARCAL programme was initiated in the area of non-destructive testing (NDT). This includes radiography, gammagraphy, ultrasonics and similar techniques that are an important part in the quality control programmes of many industries. The aims of this project are to establish a NDT capability in Latin America and the Caribbean through a regional Federation. In the long term, the project is expected to improve quality control and safety in relation to industrial production and to civil engineering works. At present there are 18 countries participating in the project, which has been funded by Italy, the Federal Republic of Germany, IAEA, UNFSSTD and UNIDO. The Agency is the executing body, and in most countries the counterparts are the national nuclear energy institutions.

LABORATORIES AND THE INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS

134. In order to assist it in its task of transferring knowledge and in performing certain services for Member States, the Agency has established the Seibersdorf laboratories, near Vienna, a Laboratory at Monaco (International Laboratory of Marine Radioactivity), and the International Centre for Theoretical Physics at Trieste.

Seibersdorf Laboratories

135. During the early years of the IAEA, laboratory facilities were very limited and much of the research focused on a programme of radioisotope calibration. Although standardization and intercalibration are today still one of the features of the laboratories' work, increased emphasis is now placed on the servicing of the Agency's programme in the field of nuclear applications and related technical cooperation projects.

136. Research activities of the Seibersdorf laboratories have expanded over the years, to include the development and application of nuclear and other scientific techniques, in support to programmes of special importance to developing countries in such areas as agricultural biotechnology, physical sciences and life sciences.

137. Every main research area at Seibersdorf gives scientists and technicians from developing Member States the opportunity to work alongside experts in the application of nuclear techniques to the solution of practical problems. On-the-job training lasts for up to one year and may include periods of work in more than one section.

138. Training courses are also organized at Seibersdorf or at laboratories in Member States with the participation of the permanent staff of the laboratories.

139. There is also a Safeguards Analytical Laboratory, where samples of nuclear materials submitted by the Agency's safeguards inspectorate are analysed.

International Laboratory of Marine Radioactivity

140. The Agency's Laboratory at Monaco was established in 1961. In 1988, new premises for the laboratory were officially opened. Its programmes are focused on three major areas: first, development and enhancement of marine radioactivity monitoring and assessment capabilities in Member State institutions through the provision of analytical quality control services (including marine reference materials), the development of relevant methodologies and the training of staff; second, provision of quantitative scientific information to Member States and international and regional organizations on the behaviour and impact of radionuclides discharged into the marine environment both intentionally and accidentally; third, assistance to Member States and international organizations involved in global pollution monitoring and research programmes through the conduct of co-operative activities and the provision of technical assistance.

141. Increasing emphasis is being given to technical assistance to developing countries through the conduct of co-operative quality control exercises, staff training, joint research and monitoring programmes, instrument maintenance, development of reference methodologies and provision of on-the-spot expert advice.

142. The programmes are funded mainly by the Agency, with additional extrabudgetary resources from UNEP, IOC-UNESCO, IUCN, and Member States where co-operative ventures and projects are of mutual interest.

International Centre for Theoretical Physics

143. The International Centre for Theoretical Physics at Trieste was established in 1964 under the auspices of the IAEA. It has been supported by the Government of Italy, the Ford Foundation, UNDP, SAREC and UNESCO, as well as by various Member States. Since 1970 it has been jointly operated by IAEA and UNESCO. The University of Trieste furnishes academic co-operation in theoretical as well as in experimental physics. The Centre and the International School for Advanced Studies (SISSA) jointly operate a computing facility located in the Centre's main building. The Centre has been operating a microprocessor laboratory, jointly with the Istituto Nazionale di Fisica Nucleare of Italy, since 1984 and a high-temperature superconductivity laboratory since 1989.

144. The purpose of the Centre is to foster, through research and training, the advancement of physics and mathematics, with particular reference to the needs of the developing countries, in order that scientists from these countries may be encouraged to continue and expand their research work. The activities of the Centre include research and high-level training for research. Research is carried out throughout the year. High-level training is offered through courses, research workshops and other scientific meetings (35-40 such programmes per year), supporting courses, workshops, conferences, and physics and mathematics teaching in the developing countries themselves as well as a visiting scholar scheme (256 such programmes have been supported since the inception of the Office of External Activities in 1985). Since 1983, the Centre has also been running a programme of training in Italian laboratories for the benefit of experimentalists from developing countries. Some 70-80 trainees are placed in Italian laboratories each year for a total of approximately 700 man/months.

145. The programme is mainly funded through extrabudgetary resources made available by Italy, the host country, which covered in 1983-1989 over 85% of the costs, with additional contributions from the Agency's and UNESCO's regular budget (8-9%) and from other donor countries (Brazil, Japan, Kuwait, Sweden and the United Kingdom).

146. The Centre has a network of associate members and one of federated institutes. Associate members are scientists from developing countries who are appointed for six years during which they may pay three research visits to the Centre lasting at least 6 weeks but not more than 3 months. In 1989, the Centre counted 464 Associate Members from all over the world. Federated Institutes are universities, faculties, departments and research centres in developing countries which are given the opportunity to send their young scientists to the training activities of the Centre for a total number of days per year ranging from 40 to 120 depending, among others, on the geographical distance of the institute from the Centre. The Centre endeavours to establish a network of these institutes among themselves and provides additional support through its Office of External Activities to a small number of selected institutes with good research programmes. In 1989, there were 382 federated institutes.

147. The Centre utilizes about 75% of the available resources for scientific activities in favour of the developing countries. The activities involved cover a wide spectrum of physics. Each year, it welcomes around 4,000 scientists in its Trieste premises for a total of about 4,000 man/months. More than half of these scientists are from developing countries and they account for 83% of the man/months. Ninety per cent of the Centre's budget is covered by the Government of Italy through the Ministry of Foreign Affairs for its regular activities and through the Direzione Generale per la Cooperazione allo Sviluppo for special programmes (e.g. external activities and training in Italian laboratories).

ADVICE ON LEGISLATION, CONVENTIONS AND AGREEMENTS

(a) Legislative and advisory services

148. The Agency continued to provide advice on nuclear legislation related to the implementation of nuclear power programmes, radiation protection and regulatory activities, nuclear liability and compensation for nuclear damage, the physical protection of nuclear material and the safe transport of nuclear material.

149. In the period 1985-1989, the IAEA held two regional seminars on nuclear law and safety regulations for developing countries in Africa and Asia. The seminars provided an overview of the scope and components of nuclear legislation and for an exchange of information on practices, experience and current developments in the regulation of peaceful nuclear activities, including issues related to radiation protection and nuclear safety, extending from regulatory preparation to the enforcement of regulations. Lecturers and experts for these courses were provided cost-free by a number of Member States.

(b) Conventions and agreements

150. Within the framework of the Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (RCA), the Agreement Establishing the Asian Regional Co-operative Project on Medical and Biological Applications of Nuclear Techniques entered into force on 20 May 1986.

151. On 12 June 1987, a new Regional Co-operation Agreement for Research, Development and Training Related to Nuclear Science and Technology (RCA) entered into force, replacing the 1972 RCA as extended in 1977 and 1982. By the end of 1989, 12 States had notified their acceptance of the new (1987) RCA.

152. On 4 April 1990, the African Regional Co-operative Agreement for Research, Development and Training related to nuclear science and technology entered into force.

153. The Convention on the Physical Protection on Nuclear Material entered into force on 8 February 1987. As of 15 June 1990, 46 states and EURATOM had signed the Convention and 28 States had become party to it.

154. Pursuant to a decision taken by the Board of Governors after the accident at Chernobyl, a group of governmental experts met in Vienna from 21 July to 15 August 1986 to draft international agreements on the early notification of a nuclear accident and on assistance in the event of a nuclear accident or radiological emergency. Experts from 62 Member States and representatives of ten international organizations attended the meeting, at which the group adopted by consensus the texts of the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. The two Conventions were subsequently endorsed by the Board of Governors and adopted by the General Conference at a special session held from 24 to 26 September 1986. The Conventions were opened for signature by all States in Vienna and at United Nations Headquarters in New York on 26 September and 6 October 1986 respectively. The Convention on Early Notification entered into force on 27 October 1986, and by

15 June 1990, there were 72 signatories and 52 parties. The Convention on Assistance entered into force on 26 February 1987, and by the end of 1989, there were 70 signatories and 45 parties.

155. In 1988, a Joint IAEA/NEA Working Group of Governmental Experts met to work on the harmonization of the Convention on Third Party Liability in the Field of Nuclear Energy (Paris Convention) and the Convention on Civil Liability for Nuclear Damage (Vienna Convention) and adopted by consensus the text of a Joint Protocol relating to the application of the Paris Convention and the Vienna Convention. The Joint Protocol is intended to extend the special liability regime established under each Convention to the parties to the other Convention for the wider protection of victims of a nuclear accident and to resolve potential conflicts of law which could result from the simultaneous application of the two Conventions. The Joint Protocol was opened for signature at an international conference jointly organized by the OECD/NEA Nuclear Energy Agency and the IAEA on 21 September 1988. By the end of 1989, 22 States had signed the Joint Protocol of which 5 States had expressed consent to be bound. In 1989, the Board of Governors established an open-ended Working Group of its Member States to consider all aspects of liability related to nuclear damage, in particular ways and means of complementing and strengthening the existing civil liability regime, and to consider also the question of international liability. In 1990, the Board of Governors dissolved the Working Group and established the open-ended Standing Committee on Nuclear Liability which held its first session in April 1990.

156. Member States of the IAEA have been requested by the Secretariat to provide it with copies of bilateral, regional and multilateral agreements on co-operation in the field of nuclear safety to which they are parties so that a compilation of the texts may be published in the Agency's Legal Series.

MEETINGS AND PUBLICATIONS

Meetings

157. The Agency convenes about 18 major meetings per year, viz. conferences, symposia and seminars, at its Headquarters and in various Member States.

158. Conferences cover a wide range of aspects of selected subjects, whereas symposia are usually restricted to more specialized topics. All Member States are invited to designate participants and to submit papers for presentation at these meetings. Papers presented and short summaries of the deliberations are published as Proceedings. These are then distributed to Member States and made available for sale.

159. Four major conferences of particular importance were held during the period 1985 - 89. Following the accident at Chernobyl, the Post Accident Review Meeting of Experts of Member States and Intergovernmental Organizations was held in 1986 in Vienna. In 1988 the following conferences were held: IAEA/CEC/OECD/NEA International Conference on Man-Machine Interface in the Nuclear Industry (Control and Instrumentation, Robotics and Artificial Intelligence) in Tokyo, Japan; International Conference on Radiation Protection in Nuclear Energy in Sydney, Australia; International Conference on the Acceptance, Control of, and Trade in Irradiated Food (FAO/IAEA/WHO/International Trade Centre UNCTAD/GATT) in Geneva, Switzerland.

160. Seminars usually deal with questions of special interest to a particular region. Normally no proceedings are published, but a technical document is issued for the participants.

161. Limited funds are made available by the Agency to facilitate participation of scientists/experts from developing countries. The table below shows the total number of participants in these meetings, as well as the number of participants from developing countries to whom financial support was offered over the period 1985-1989.

CONFERENCES, SYMPOSIA AND SEMINARS, 1985-89

	No of participants	No. of Member States	No. of developing countries
1985	2478	89	66
1986	2869	81	57
1987	1771	83	61
1988	2930	84	61
1989	1453	101	81

Financial support offered to participants from developing countries:

	No. of participants	No. of developing countries
1985	218	50
1986	219	47
1987	200	48
1988	216	47
1989	136	55

162. Apart from the three types of meetings mentioned above, the Agency convenes a large number of smaller meetings such as Advisory Groups which give specialized advice on particular aspects of the Agency's programme and Technical Committee which review specific areas of nuclear science and technology. The latter category of meetings may result in the publication of Technical Reports. Specialists' meetings are organized on the recommendation of International Working Groups or other standing committees; participation is limited to experts from Member States represented on the appropriate working groups and standing committees.

163. In addition, Research Co-ordination Meetings are convened at and outside Headquarters in relation to the Agency's Research Contract Programme to further the exchange of information among co-operating institutes and to allow the scientists concerned to report on the progress of their individual projects.

164. In addition to organizing its own meetings, the Agency arranges co-sponsorship with other international organizations, when considered appropriate, so as to extend the exchange of information to other fields closely related to nuclear science and technology. It also publishes a quarterly entitled "Meetings on Atomic Energy" which gives a comprehensive listing of the main meetings, exhibitions and courses related to atomic energy planned throughout the world.

165. Annex VIII shows the list of Conferences, Symposia and Seminars for the period September 1985 - September 1990.

Publications

166. A large number of Agency activities - the arranging of specific studies, the holding of international meetings, training courses, co-ordinated research programmes, etc. - result in the publication of books, periodicals or documents.

167. The editing, typesetting, layout, design, printing and sales operations for these publications are carried out by the Agency itself. The Agency is thus a major scientific publishing house and, in fact, the world's largest publisher in the nuclear field.

168. A certain number of copies of all priced publications are distributed free to all Member States. The rest are offered for sale, and the income thus derived is credited to Member States.

169. In addition, the Agency also produces many "unpriced" publications - unedited books which might represent the interim results of a particular study or information which is of value to a restricted audience. These are produced in smaller numbers and distributed free of charge to those to whom they will be of greatest interest.

170. The various types of the Agency's major publications can be seen from the following table:

NUMBER OF PRINTED PAGES CLASSIFIED BY SERIES 1985-1989

Series	1985	1986	1987	1988	1989
Proceedings Series	5,976	5,856	8,028	7,116	6,504
Panel Proceedings Series	820	1,544	1,644	2,972	1,856
Technical Directories	-	-	-	156	-
Safety Series	2,668	3,378	3,620	3,158	3,792
Technical Reports Series	3,112	3,280	1,640	1,968	2,140
ITER Documentation Series	-	-	-	-	748
Legal Series	276	344	136	148	400
Scientific Journals	2,036	2,148	2,292	2,172	2,668
International Atomic Energy Agency Bulletin	1,248	1,460	1,456	1,276	1,196
Miscellaneous	3,716	2,384	2,710	3,266	3,316
CINDA Publications	564	668	760	736	804
INIS Publications	26,812	29,224	34,900	27,712	23,784
TOTAL:	47,228	48,286	57,206	50,680	47,208

ANNEX I

NUCLEAR MATERIAL DELIVERED BY MEMBER STATES
IN CONNECTION WITH TECHNICAL ASSISTANCE PROJECTS
INCLUDING NUCLEAR DATA PROGRAMME

FROM 1985 TO 1988

Supplier	Recipient	Material	Shipped	
1985				
USA	Romania	4 g uranium containing 0.756g U-235	January 85	
USA	Poland	0.75 g Plutonium, 7 g uranium enriched to approx. 38.6% in U-235, 0.005 g uranium-233, and 21.2 g of natural uranium	March 85	
UK	Brazil	5 each Pu-242, Np-237, U-233, Pu-241, U-234, U-235 sample material	July 85	ND
UK	Libya	27 mCi Cf-252	July 85	
UK	Peru	1 Ci Am-Be source	July 85	
UK	Brazil	4 each Pu-239 and 4 U-233 sample material	August 85	ND
UK	Hungary	1 each Pu-240 target	October 85	ND
Canada	Brazil	300 g Uranium ore	October 85	
UK	Kenya	100 mCi Pu-238		
1986				
UK	Guatemala	100 mCi Pu-238	April 86	
USA	Bangladesh	Am-241 certified standard 0.1 to 5 µCi	August 86	
UK	Algeria	370 MBq Am-241	August 86	
UK	Romania	2 each U-235, Th-232, Np-237 targets	October 86	ND
UK	Chile	1 Ci Am/Be source	November 86	
CPR	Ivory Cost	5 Ci Am-241	December 86	
USA	Brazil	133g uranium isotopic and assay standards containing about 6.5g U-235	December 86	
CSSR	Bulgaria	Am-241 gamma source, 0,1 MBq	June 86	ND
UK	Peru	U-238 disc source 370 Bq 10 nCi	December 86	

NUCLEAR MATERIAL DELIVERED BY MEMBER STATES
IN CONNECTION WITH TECHNICAL ASSISTANCE PROJECTS
INCLUDING NUCLEAR DATA PROGRAMME

Supplier	Recipient	Material	Shipped
1987			
UK	Philippines	30 mCi Am-241	June 87
UK	Algeria	10 µCi Cf-252	November 87
UK	Costa Rica	5 Ci Am/Be source	December 87
UK	Thailand	500 mCi Am-241	December 87
1988			
UK	Philippines	Am-241 neutron source 370 MBq	February 88
UK	Egypt	Am-241 standardized solution 0.54 µCi	February 88
CSSR	Romania	Am-241 gamma source, 74 MBq	February 88
USA	Nigeria	30 mCi Am-241 source	February 88
Canada	Malaysia	1.024 µCi Am-241 calibration source	March 88
USA	Egypt	Pu-239 calibration standard, 0.01 to 5 µCi	March 88
USA	Venezuela	25 mCi Am-241 annular X-ray source	March 88
UK	Colombia	100 mCi Am-241 annular X-ray source	May 88
USA	Nigeria	30 mCi Am-241 annular X-ray source	July 88
FRG	Cameroon	30 mCi Am-241 source	April 88
UK	Hongkong	14 mCi Am-241	September 88
USA	Chile	25g U-235 certified sample 26 g Uranium metal	October 88
UK	Syria	50 g U-238	November 88
USA	Thailand	neutron source containing 0.63 mCi Cf-252 (solid form)	October 88
USA	Chile	1 g enriched U-308	November 88

NUCLEAR MATERIAL DELIVERED BY MEMBER STATES
IN CONNECTION WITH TECHNICAL ASSISTANCE PROJECTS
INCLUDING NUCLEAR DATA PROGRAMME

Supplier	Recipient		Material	Shipped	
1988					
USA	Algeria	2	1 µCi Am-241 source	May 88	all ND
USA	Bangladesh	1	1 µCi Am-241 source	May 88	
USA	Bolivia	1	1 µCi Am-241 source	May 88	
USA	Chile	3	1 µCi Am-241 source	May 88	
USA	Colombia	1	1 µCi Am-241 source	May 88	
USA	Dominican Rep.	1	1 µCi Am-241 source	May 88	
USA	Ecuador	1	1 µCi Am-241 source	May 88	
USA	Ghana	1	1 µCi Am-241 source	May 88	
USA	Guatemala	1	1 µCi Am-241 source	May 88	
USA	Iraq	1	1 µCi Am-241 source	May 88	
USA	Jordan	1	1 µCi Am-241 source	May 88	
USA	Kenya	1	1 µCi Am-241 source	May 88	
USA	Libya	1	1 µCi Am-241 source	May 88	
USA	Nigeria	1	1 µCi Am-241 source	May 88	
USA	Paraguay	1	1 µCi Am-241 source	May 88	
USA	Portugal	1	1 µCi Am-241 source	May 88	
USA	Saudi Arabia	1	1 µCi Am-241 source	May 88	
USA	Singapore	1	1 µCi Am-241 source	May 88	
USA	Sudan	1	1 µCi Am-241 source	May 88	
USA	Syria	2	1 µCi Am-241 source	May 88	
USA	Thailand	5	1 µCi Am-241 source	May 88	
USA	Turkey	1	1 µCi Am-241 source	May 88	
USA	Venezuela	1	1 µCi Am-241 source	May 88	
USA	Zambia	1	1 µCi Am-241 source	May 88	

ND = Nuclear Data programme

NUCLEAR MATERIAL DELIVERED BY MEMBER STATES IN CONNECTION WITH TECHNICAL ASSISTANCE PROJECTS

Supplier	Recipient	Material	Shipped
1989			
CPR	Niger ia	5 Ci Am-241	March 89
USA	Romania	20 mCi Am-241	March 89
UK	Poland	10 µg Cf-252	March 89
FRG	Panama	169 KBq Am-241	April 89
UK	Egypt	1 mCi Am-241	April 89
		1 mg Np-237	April 89
FRG	Pakistan	14 mCi Am-241	May 89
UK	Romania	7.4 KBq Am-241	June 89
		1.85 KBq Am-241	June 89
UK	Iraq	Mixed Radionuclide Gamma Ray ref. solution QCY.44 (total activity appr. 185 KBq)	June 89
France	Romania	3 kBq Pu-238	June 89
		3 kBq Pu-239	June 89
UK	Ecuador	200 KBq Am-241	July 89
UK	Colombia	0,74 KBq Am-241	July 89
USA	Indonesia	100 mCi Am-241	July 89
		Standard reference material:	
		2 x 50 gm Uranium oxide, U_3O_8	September 89
		2 x 75 gm Uranium (depleted) metal	September 89
		7 x 25 gm Uranium (Normal) oxide U_3O_8	September 89
		7 x 25 gm ditto	September 89
		2 x 1 gm Uranium (Enriched) Isotopic U_3O_8, 15 % U-235	September 89
		2 x 1gm ditto, 20 % U-235	September 89
UK	Colombia	0.74 KBq Am-241 mixed nuclides: total 7.4 KBq, appr. equal activity of Am-241, Cu-244 and Pu-237	November 89-
USA	El Salvador	50 µCi Am-241	November 89
France	Romania	1.5KBq Am-241	November 89
		0.15 KBq U-233	November 89
UK	Viet Nam	25 mCi Am-241	November 89
FRG	Brazil	200 mCi Am-241	December 89
FRG	Brazil	14 mCi Am-241	December 89

ANNEX II.A

CHANGES IN SUPPLY AND DEMAND 1980–1988

As problems of assurance of supply have in the past occured mainly in the world outside centrally planned economies area (WOCA), this review will naturally focus principally on developments in WOCA. The availability of suppliers for initial supplies provides the reference situation. If the situation changes after the initial supplies have been delivered, questions of assurance of continuing supplies arise as well. The following aspects will thus be treated here: availability of suppliers for initial supplies; how the market has developed and functioned; policy influences on supplies, i.e. effects of bilateral supply agreements and of other policy actions such as embargoes; availability of financing; and interdependence of the international market.

With regard to the last point, it is important to see what influence stagnation in domestic demand for new plants in many countries has had on the export market and on industry's ability to maintain supply assurances on a continuing bases, particularly in the support of power plant operation, maintenance and repair.

The following categories of supply will be dealt with: plants and equipment; uranium; front end fuel cycle services; complete fuel supply; back end cycle services; and technology and operational support.

DEVELOPMENTS DURING 1980 – 1988

Plant Supply Situation

Nominally the number of plant suppliers in WOCA remained about the same, but this is probably too optimistic a picture. In most WOCA supplier countries, with the exception of France, Japan and the United Kingdom, there were no new orders for power plants between 1980 and 1988. The industry is completing plants ordered earlier, at a rate equivalent to some 10 GW(e) per year, with an additional 6 GW(e) per year in France and Japan. The industry's capacity in these countries was estimated to be 50–60 GW(e) per year in the early 1980s and its is clear that several suppliers have had to cut back design capabilities and specialize more in providing services to plants in operation. It is doubtful whether all of these suppliers are available today as suppliers of new plants.

The reasons for the stagnation of nuclear power plant orders are not examined here, but it is important to note that many predict that the resumption of ordering will require the availability of standardized plant designs which can be built with predictable licensing requirements and within predictable capital costs and construction schedules. This would probably also mean a return to contracting forms such as the turn-key contract in combination with new financing modes, as noted below.

The number of plant exports diminished drastically between 1980 and 1988, with only six units contracted for in this period. Four of these units are from one supplier company in France and two from another in the United States of America.

On the other hand, new potential supplier countries are emerging with industries which have a satisfactory domestic order situation. Not all could deliver complete nuclear power plants or nuclear stream supply systems, but their capabilities are expanding. These countries are: Argentina (engineering and plant equipment, research reactors); Brazil (plant equipment); China (fuel and enrichment); India (engineering); Japan (complete plants); Republic of Korea (engineering and plant equipment); and Spain (engineering and plant equipment).

In the centrally planned economy (CPE) countries, plant construction continued and some PWR plants were also offered for export outside the member countries of the Council for Mutual Economic Assistance (CMEA); most recently 2 x 1000 MW(e) to India (supply agreement in 1988). Exports to CMEA countries continue.

The number of prospective buyers among developing countries depends among other things on the availability of suppliers that can offer standardized and proven plants. Several have been competing for a very small number of potential export orders. While orders for six units were placed during 1980-1988, there are several cases where negotiations did not result in an order. In one case (Pakistan), the invitation to bid did not elicit any bids. In two others (Egypt and Turkey), negotiations did not yield any results. In one other case they are still going on. Two problems emerge from these cases: first, the plants offered are very large; and second, offers finally failed because of financing problems.

With regard to the first point, there is now a revival of interest in smaller plants. In 1985 the IAEA published IAEA-TECDOC-347, Small and Medium Power Reactors: Project Initiation Study Phase I, on the availability of such reactors for developing countries. In this it was pointed out that some five plant designs existed at the time which could be considered technically proven and suitable for use in developing countries, but that a detailed feasibility study would be needed to obtain a clearer understanding of the economics of such a plant. It can further be noted that all five plant suppliers in North America are now preparing to offer plants of 600 MW(e) or smaller, with added passive safety features. A PHWR of 300 MW(e) is also being offered. All these plants may first be made available on the domestic market, but they would then certainly be offered for export as well. In five to ten years' time it is possible that a new generation of plants will be available with features which should be attractive to new buyers.

In 1988, an agreement was concluded for export of high temperature reactor technology for small reactors from the Federal Republic of Germany and the Union of Soviet Socialist Republics.

The second point, the question of financing limitations, appears to be more serious. For the plants bought by developing countries in the early and mid-1970s there were financing arrangements with such features as firm - and low - interest rates. Such arrangements no longer seem to exist and financing institutions have in general adopted a very cautious attitude to larger nuclear projects. It is now also impossible to obtain financing from one country or credit guarantees from one government alone, and this has necessitated multinational offers with complex financing conditions. Finally, a 1984 "consensus" agreement of the Organization for Economic Co-operation and Development rules out any concessionary terms for the financing of nuclear plant exports. Indeed, the conditions laid down for the export of nuclear power plants make it questionable whether nuclear plants can compete with plants fired with imported coal, as the base interest rate, for example, would be higher by 1%. The situation is that importers from among the industrialized and relatively prosperous developing countries could find financing, but developing countries which have financial difficulties would scarcely be able to do so.

To break this deadlock would probably require new financing models, such as 'build-operate-transfer' (BOT) or 'build-own-operate' (BOO). In both, a foreign consortium (probably multinational) finances, builds and operates a plant, and the customer country guarantees to purchase the energy produced. The BOT model foresees the transfer of plant ownership when the investment has been recouped. It is important in this context to note that the BOO model is being considered for a fossil fired plant complex to be constructed in Pakistan with World Bank participation. So far, no nuclear projects have been financed in this way. It is nevertheless significant that one of the offers which did not result in a contract and ongoing negotiations in another case (Indonesia) concern BOT types of contract.

In conclusion, financing constraints stemming from a variety of causes seem to be the most important factor affecting the primary supply situation.

Uranium Supply Situation

The uranium supply situation has changed dramatically since 1980, but at the same time it has shown remarkable resilience. The spot market price (in current US dollars) dropped from about $43/lb oxide in 1976-1978 to less than $15/lb in 1988. The long term contract supply price has remained fairly stable at around $30/lb. The USA, which in 1973 accounted for 50% of the total production in WOCA (10 000 out of 20 000 t) and in 1981 produced 14 8000 t, produced only 4200 t (or 12%) in 1987, out of a WOCA total of 36 000 t. There were, on the other hand, major production increases, mainly in Australia and Canada, to meet the increasing demand, even at the lower prices prevailing.

There are thus still good prospects of obtaining assured supplies through the market and diversification of suppliers; from the suppliers's point of view, however, there is serious potential for destabilization. The USA now requires about 15 000 t/year for its power reactors and, if this market were to be closed to outside suppliers, the result would be a production overcapacity outside the USA which might change the supply situation markedly. A recent decision in the USA would seem to exclude the possibility of this happening.

Exploration for new uranium resources has been cut back sharply in WOCA since 1979, when US $760 million were spent. From 1984 to 1987 only US $120-150 million were spent annually.

When uranium prices increased suddenly in 1975-1976, the demand was approaching the existing production capacity in WOCA. This seems likely to happen again in the next few years, but a similar price increase should not occur. The situation will in this case be moderated both by large existing stocks held by the major buyers and by the readiness of major suppliers to put new resources into production.

The major uranium suppliers still appear confident of being able to meet an increased future demand from present resources and from future resources which have already been identified.

A number of uranium export embargoes were imposed before 1980. No further embargoes have been applied since then.

Uranium Enrichment

Between 1980 and 1988 four new industrial plants in four countries (France, the Federal Republic of Germany, the Netherlands and the United Kingdom) added significantly to the annual capacity, and there are now six countries which can offer enrichment services internationally for nuclear power plants. Domestic enrichment capabilities have also been developed in Argentina, Brazil, India, Japan, Pakistan and South Africa. Argentina has supplied enriched fuel for research reactors abroad (to the Islamic Republic of Iran and Peru). China has also supplied enriched uranium internationally (to Chile). The technology is very difficult to master.

Fuel Fabrication

Fuel fabrication has never been of serious concern in relation to supply assurances. The technology is easily acquired and between 1980 and 1988 seven countries (Argentina, Belgium, Brazil, the Federal Republic of Germany, the Republic of Korea, Pakistan and Spain) started fuel fabrication for power plants on an at least semi-industrial scale. In 1988, all but four of the WOCA countries with nuclear power plants in operation had domestic fuel fabrication capability.

Complete Fuel Supply

It follows from the front end supply situation described above that most buyers have succeeded in obtaining assured supplies through diversification of supply sources and that often several suppliers and supplier countries are involved in the supply of a single fuel batch. In just two cases (India and the Islamic Republic of Iran) there were supply interruptions during the period covered here, but in both instances it was possible to find alternative supplies.

Back End Fuel Cycle Services

Fast breeder development programmes were postponed or delayed during 1980-1988. The economics of plutonium are still disputed, but several countries (including France, the Federal Republic of Germany and Japan) have chose to reprocess spent fuel and recycle plutonium for energy security reasons. There is now, as in 1980, no international market for plutonium and most countries with operating nuclear power plants have opted to store the spent fuel indefinitely.

Only one country (France) at present offers reprocessing of oxide fuel internationally. Reprocessing plants to meet domestic needs are operated by Japan and the United Kingdom. A reprocessing plant for domestic needs are operated by Japan and the United Kingdom. A reprocessing plant for domestic services was started in Italy. The construction of a major plant is planned in the Federal Republic of Germany and another one in Japan. A plant on at least pilot scale is under construction in Argentina. The technology is complex. Only one country has obtained it from abroad, and that under strict conditions.

There are thus not many choises for the back end of the fuel cycle. Indefinite storage of spent fuel could remain the option selected by most, and it is worth noting that in a number of countries away from reactor (AFR) spent fuel storage facilities have been built or are under construction. National policies in most countries would not permit the acceptance of foreign spent fuel for storage but the USSR accepts spent fuel originating from within its own territory.

Technology and Operational Support

The initial transfer of technology would still probably have to come from the supplier of the first power plant, but the emergence of the new suppliers mentioned above could provide alternatives for continuing technology supply, thus opening up the possibility of diversification. In addition there have been significant advances in the technological capabilities of several buyer countries, as shown by the improvements in domestic industrial support and the availability of trained and experienced manpower.

The dependence of these buyers on continuing technology transfer from one, i.e. the original, source has thus diminished.

One controversial problem area is that of assured continuing supply of safety related information from the original plant supplier. Absence of such information may jeopardize the operation of a power plant in the long term. Several supplier States have maintained that the supply of safety information must be balanced against non-proliferation requirements. This question was raised both on the Board of Governors and in the IAEA General Conference in 1987, which requested "the Director General to intensify efforts to promote co-operation between States, particularly between supplier and recipient States in the exchange of such information.

A related problem area concerns the discontinuation of supplies of replacement and maintenance equipment initiated before 1980 and still in force. However, it has generally been possible to find new supplies of such equipment, either domestically or from other outside suppliers.

DEVELOPMENTS IN SUPPLY AGREEMENTS

The situation in 1980 was characterized by recent changes in the export policies of some of the major suppliers and the subsequent renegotiation of bilateral supply agreements. While this renegotiation is continuing in a few cases, the situation has now stabilized. The London Suppliers' Group did not formulate any new guidelines. The restriction on the export of 'sensitive' technologies, generally understood as enrichment and reprocessing, remain in force.

The 'stabilization' of the situation is characterized by the following factors: first, there have been no changes among the supplier countries which require NPT (Non-Proliferation Treaty) or an equivalent 'full scope' commitment for any supply; second, others require safeguards on the supplies concerned; third, so far, the 'new' suppliers (Argentina and China) at least require safeguards on the supplies concerned (Argentina and China in 1987 made statements as to their export policies); and fourth, there has been no change in requirements for labelling material according to origin.

On the other hand, there have been changes as regards the requirement that the supplier goverment's authorities give prior consent before material is moved to another facility, e.g. for reprocessing. Three supplier governments (Australia, Canada and the USA) which had reserved the 'prior consent' right for themselves have in several cases offered and exercised this right in a long term predictable manner on a 'programmatic basis'. This would give the buyer government assurances that it can reprocess spent fuel and recycle plutonium to help meet national energy security objectives.

Bilateral agreements in many cases continued to stipulate that material batches, including future generation of material, be labelled according to the country of origin. Such agreements can lead to several labels being applied to a particular batch of material as suppliers from several countries may have been involved in the supply of one particular fuel batch. By the end of 1988 there had been only a few examples of how labelling requirements will work for second and future generation material, for which complications can become severe.

Nuclear operators (of power plants as well as fuel cycle facilities) often exchange material with each other ('swaps') in order to reduce costs and avoid the risks of transport. This swapping is being done on an increasing but still fairly small scale, but questions are being raised in some supplier countries as to whether this is acceptable in the context of national non-proliferation policies. The swaps may entail a variety of different legal definitions (e.g. origin, title, non-proliferation obligations) and they thus involve a very complex matter. They are the subject of continuing bilateral negotiations between suppliers and buyer authorities. It still remains to be seen whether restrictions on swaps can be detrimental to supply assurances.

SUMMARY

The characteristics of the supply/demand situation can be summarized as follows: first, the international market has generally been a strong 'buyer's market', with ample possibilities for diversification of supplies. second, while some plant suppliers may not be able to continue to offer plants for export, new potential suppliers have appeared; third, the domestic capabilities of many buyer countries have improved, notably in fuel fabrication; fourth, there have been no major changes in suppliers' export policies, but some show flexibility in the application of constraints, notably 'prior consent rights'; fifth, there have been some cases of interruption of supplies, but these all stemmed from the period before 1980, and in most cases it has been possible to find alternative sources.

In the view of most suppliers the present situation is not one of supply assurances but rather of 'demand assurances' as the lack of predictability of demand in several sectors is creating difficulties in the supplier industry.

UPDATE ON THE SUPPLY AND DEMAND SITUATION 1990

URANIUM SUPPLY SITUATION

During 1989 the spot market price for yellowcake (U_3O_8) fell from $15/lb in mid 1988 to just over $9/lb. This is lower in constant US$ than the some $4.50/lb quoted as a steady market price for a long period from the end of the 1950s and through the 1960s, and therefore represents an all-time low. The actual price paid for U_3O_8 under existing long-term contracts remained in the range of $25-30/lb, but the spot market took an increasing share of the total market, 16.7% of the demand to fuel reactors in 1989, and utilities bought just over half of this amount (9%) on the spot market. This indicates a strong emergence of new "traders" in the uranium market who are not necessarily uranium users. The uranium market may thus move more towards a "normal" commodity market.

The very low price for yellowcake has had a significant impact. Many producers, mostly in the USA, but also in Canada and elsewhere, can no longer produce competitively, even on marginal costs, and have had to close down their mines. From the buyer's point of view, there is already less choice among producers and supply assurances through diversification of supply could be less certain in the future. It will also be less attractive for new potential suppliers, such as developing countries with significant uranium resources, to develop these resources in order to enter a very difficult market.

Against this general trend, there are two specific new aspects to take into account:

- The Soviet Union has indicated its preparedness to become a major supplier of both uranium and enrichment services. It is now supplying about 5% of the market outside CPE and could expand that fraction considerably with available capacity;

- The independence of Namibia could mean a new major independent supplier of yellowcake. The supply capacity of the Rossing mine is 4600 tons U/year. Production in 1989 was estimated to be only 3300 tons U. There is thus a considerable excess capacity for new orders and the mine is one of the lowest cost producers.

The important excess inventories of uranium held by the utilities have been a major factor in the market, as the owners have made available large quantities to traders.

To summarize, the present low uranium prices may thus seem to favour buyers, but this may well be only a short to medium term effect for a number of reasons:

- declining number of suppliers;

- the spot market trading prices being influenced to some extent by inventory trading — in which some utilities have been drawing down their inventories;

— the low prices making it impossible for suppliers to invest in exploration for new resources.

These are factors which may contribute to volatility in the future market — as past experience has shown — with increasing supply difficulties and possibly increasing prices as a consequence.

The concern expressed in the report of November 1988 that the USA may close its market to outside suppliers has not materialized.

PLANT SUPPLY SITUATION

There have been no major changes in the international market for plant supply, but there are some trends worth noticing. India has been negotiating for supply of 2 x 1000 MW(e) units from the Soviet Union, but the agreement has still to be concluded.

In February 1990, the French Government announced that it had no objection to French firms supplying a nuclear power plant to Pakistan, possibly in co-operation with other suppliers.

In the Western industrialized countries, the restructuring of the supply industry has continued. The merger of the Swedish ASEA with the Swiss Brown Boveri Company into ABB has created a major potential supplier with experience from both BWRs and HTGRs and the subsequent takeover of Combustion Engineering (USA) has added an experienced PWR supplier to the concern, which undoubtedly is ready to offer plants in the international market. The French Framatome and the German Siemens have joined in a combined effort for the export market. There is thus a trend towards formation of very big supplier entities.

There are signs of slow revival of interest on the side of some governments to support the nuclear plant industries to meet future demand. The Department of Energy in the USA has, e.g., decided to support design work at both Westinghouse and General Electric Co. for a new generation of nuclear power plants in the size range of 600 MW(e) which could be offered commercially in the mid-1990s and which would thus also be of interest to many potential importing countries.

There have also been moves in other industrialized countries, e.g., Finland, which have had moratoria on new plant construction, to prepare for new nuclear plant orders or to prepare the national industry for resumed or new construction.

The uncertainty about what the real capacity for supply of new plants is increasing. In 1984 and again in 1985, 33 new nuclear plants with 31 GW(e) were put on line in the world, but in 1989 there were only 12 plants with 10.4 GW(e) which entered operation. The plant supply industry of necessity has turned more and more towards plant maintenance and repair, and it remains a serious question how much of the capacity to produce new plants, estimated to be in the range of 50-60 GW(e)/year in the early 1980s, would remain if called upon by an expanding international market.

A major problem, which appears to have grown worse in many countries in 1989, is that of acceptability of nuclear power. If the industrialized potential supplier countries are reducing or cancelling nuclear power programmes, qualified manpower may be irreversibly lost from the supply industry and its capacity to supply plants would be further affected. This would pose an additional major problem for potential importing countries.

New suppliers:

The emergence of new supplier countries has been confirmed as is shown by the following examples.

China

The People's Republic of China offered in mid-November to supply a 300 MW(e) PWR station to Pakistan. The plant will be an improved version of the PWR being constructed at Qinshan by Chinese industry, and is to be built in northern Punjab at Chasma, near the existing reactor fuel fabrication facility. This is an important event since it would be the first example of a nuclear power plant export by one developing country to another. China has also supplied a miniature neutron source reactor to Pakistan, which has been placed under IAEA safeguards through a bilateral agreement between Pakistan and the IAEA.

Argentina

Argentina has supplied a 10 MW(th) research reactor to Peru, a 1 MW(th) research reactor to Algeria, and will supply a 250 KW(th) reactor to Albania under a UNDP/IAEA TC project. In all cases, fuel enriched to 20% in Argentina is included in the delivery. The Algerian reactor is under IAEA safeguards, pursuant to an INFCIRC/66 Rev.2 type agreement concluded in 1989. Albania has a "full scope" safeguards agreement with the Agency.

Furthermore, Argentina has bid to supply a research reactor and related support facilities for Egypt, which would use them to conduct basic research. Argentina and Egypt have signed a fuel cycle agreement paving the way for exports of equipment and services under IAEA safeguards.

Finally, the Argentinian company Invap is negotiating supply of a modular 25 MW(e) Carem-15 LWR to Turkey for installation near Ankara as a source of base load power. Some developing nations seem interested in this reactor.

CPEs in East Europe

According to Comecon safety experts, the first generation of VVER-440s need extensive backfitting. This does not concern the present supply situation as all plants under construction are of a later type.

Small and medium power reactors (SMPR)

A revival of interest in smaller power reactors has been noticed within some OECD countries and an expert group has been constituted by the Nuclear Energy Agency (NEA). A report reviewing the situation is under preparation. The various concepts coming into consideration should be compared in the framework of a case study in 1990. This should provide an updated perspective on supply of such reactors to developing countries.

Some high temperature reactor (HTR) co-operation projects are awaiting further decisions. The premature decommissioning of the German THTR-300 has tended to slow progress in international co-operative projects.

An Anglo-US consortium has developed a design for a 300 MW(e) PWR, the "Safe Integral Reactor" (SIR), which may meet with interest from some utilities.

The IAEA has a footnote a/ TC project on a feasibility study for a SMPR in Egypt. Canada, Finland, the Federal Republic of Germany and the USA have decided to co-operate on the project. During 1989, a schedule for the project was laid down by all participants, aiming at a report by 1990-1991.

Export credit conditions and contracts

There has been no change in the export credit conditions for nuclear power plants. The World Bank remains doubtful about exports of nuclear plants to developing countries, but has so far not been asked to finance any specific plant. The World Bank has, however, granted sectoral loans to the electricity generating industries in countries with nuclear power programmes (e.g. Poland) and has consulted with the IAEA in the course of evaluating these loans.

There have been no concrete new developments in methods of financing nuclear power plant exports to developing countries. There is, however an interesting negotiation between EdF, France, and the Ministry of Energy of Hungary, for the supply of a nuclear power plant for which the foreign exchange component would be repaid by exports of electric energy to third party countries. This type of arrangement could possibly also have application to a few developing country situations.

There is also some indication that the build-own-operate (BOO) model of financing may be used in at least one industrialized country (but for fossil-fired plants — so far not for nuclear plants) which would possibly indicate some move towards more unconventional modes of financing new plant construction.

BACK-END FUEL CYCLE SERVICES

As a result of the abandonment of the Wackersdorf reprocessing plant project, the utilities in the F.R. Germany have turned to Cogema and BNFL with a large increase in demand. The F.R. German utility parent

company, Veba, is considering joining Cogema in a joint reprocessing plant project. Increased demand from the F.R. Germany is not expected to have any effect on existing contracts from other countries as there would still be an excess reprocessing capacity for prospective customers, especially in view of the BNFL-Thorp plant getting into operation in 1992 for reprocessing of uranium oxide fuel.

DEVELOPMENTS IN SUPPLY AGREEMENTS

The "Zangger Committee" has issued new guidelines for triggering IAEA safeguards by the export of a defined list of items in relation to diffusion enrichment plants. There are no other developments of significance.

ANNEX III

See booklet: "Promotion and Financing of Nuclear Power Programmes in Developing Countries". Report to the IAEA by a Senior Expert Group. International Atomic Energy Agency Vienna, 1987

See International atomic energy agency

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ANNEX IV

See booklet: "The International Atomic Energy Agency's Contribution to Sustainable Development".
Nuclear energy and the environment:
A report prepared at the request of the IAEA General Conference for presentation to the United Nations General Assembly. Vienna, 1989

See International atomic energy agency
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ANNEX V

VOLUNTARY CONTRIBUTIONS PAID TO THE TECHNICAL ASSISTANCE AND CO-OPERATION FUND, 1985-31 December 1989

Member State	1985		1986		1987		1988		1989	
	Share of target $	Amount paid $	Share of target $	Amount paid $	Share of target $	Amount paid $	Share of target $	Amount paid $	Share of target $	Amount paid $
Afghanistan	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Albania	2,600	2,600	3,000	3,000	3,400	3,400	3,800	-	4,200	-
Algeria	33,800	-	39,000	39,000	47,600	18,803	53,200	-	58,800	-
Argentina	182,000	-	210,000	-	207,400	-	231,800	-	256,200	-
Australia	403,000	402,977	465,000	465,000	557,600	361,750	623,200	431,655	688,800	543,103
Austria	192,400	192,400	222,000	222,000	248,200	248,200	277,400	277,400	306,600	306,600
Bangladesh	7,800	7,800	9,000	-	6,800	-	7,600	-	8,400	-
Belgium	330,200	78,431	381,000	108,108	397,800	114,613	444,600	103,896	491,400	-
Bolivia	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Brazil	356,200	243,200	411,000	243,200	469,200	250,000	524,400	249,610	579,600	-
Bulgaria	46,800	46,800	54,000	54,000	54,400	54,400	60,800	60,800	67,200	67,200
Byelorussian SSR	93,600	94,221	108,000	114,503	115,600	116,720	129,200	124,916	142,800	143,008
Cameroon	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Canada	793,000	793,000	915,000	915,000	1,030,200	988,122	1,151,400	1,067,255	1,272,600	1,005,004
Chile	18,200	18,200	21,000	21,000	23,800	23,800	26,600	26,600	29,400	29,400
China	226,200	228,302	261,000	261,000	285,200	285,200	296,400	296,400	327,600	327,600
Colombia	28,600	19,000	33,000	33,000	44,200	-	49,400	-	54,600	-
Costa Rica	5,200	-	6,000	-	6,800	-	7,600	-	8,400	-
Côte d'Ivoire	7,800	-	9,000	-	6,800	-	7,600	-	8,400	-
Cuba	23,400	23,400	27,000	27,000	30,600	30,600	34,200	34,200	37,800	37,800
Cyprus	2,600	2,600	3,000	2,600	6,800	6,800	7,600	7,600	8,400	8,400
Czechoslovakia	195,000	195,000	225,000	225,000	234,600	234,600	262,200	262,200	289,800	289,800
Democratic Kampuchea	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Dem People's Rep Korea	13,000	13,000	15,000	15,000	17,000	17,000	19,000	19,000	21,000	21,000
Denmark	192,400	192,400	222,000	222,000	241,400	241,400	269,800	269,800	298,200	298,200
Dominican Republic	7,800	-	9,000	-	10,200	-	11,400	-	12,600	-
Ecuador	5,200	5,200	6,000	6,000	10,200	-	11,400	-	12,600	-
Egypt	18,200	18,200	21,000	21,000	23,800	23,800	26,600	23,800	29,400	21,812
El Salvador	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Ethiopia	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Finland	122,200	122,200	141,000	141,000	166,600	166,600	186,200	186,200	205,800	205,800
France	1,674,400	1,674,400	1,932,000	1,932,000	2,142,000	2,142,000	2,394,000	2,394,000	2,646,000	2,646,000
Gabon	5,200	-	6,000	-	10,200	-	11,400	-	12,600	-
German Dem Rep	356,200	356,200	411,000	411,000	445,400	445,400	497,800	497,800	550,200	550,200
Germany, Fed Rep of	2,197,000	2,197,000	2,535,000	2,535,000	2,777,800	2,777,800	3,104,600	3,104,600	3,431,400	3,431,400
Ghana	5,200	-	6,000	4,816	3,400	-	3,800	-	4,200	-
Greece	101,400	101,400	117,000	117,000	146,200	146,200	163,400	-	180,600	-
Guatemala	5,200	5,000	6,000	-	6,800	6,800	7,600	-	8,400	-
Haiti	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Holy See	2,600	-	3,000	1,000	3,400	-	3,800	2,000	4,200	2,000

Member State	1985		1986		1987		1988		1989	
	Share of target $	Amount paid $	Share of target $	Amount paid $	Share of target $	Amount paid $	Share of target $	Amount paid $	Share of target $	Amount paid $
Hungary	59,800	36,785	69,000	79,611	74,800	80,899	83,600	92,340	92,400	79,365
Iceland	7,800	7,800	9,000	9,000	10,200	10,200	11,400	11,400	12,600	12,600
India	93,600	93,600	108,000	108,000	119,000	119,000	133,000	133,000	147,000	147,000
Indonesia	33,800	33,800	39,000	39,000	47,600	39,000	53,200	39,000	58,800	39,000
Iran, Islamic Rep of	148,200	-	171,000	-	210,800	-	235,600	-	260,400	-
Iraq	31,200	31,200	36,000	36,000	40,800	20,400	45,600	45,600	50,400	-
Ireland	46,800	20,000	54,000	30,000	61,200	61,200	68,400	-	75,600	-
Israel	59,800	-	69,000	-	74,800	-	83,600	-	92,400	-
Italy	962,000	514,469	1,110,000	514,470	1,275,000	617,761	1,425,000	586,081	1,575,000	-
Jamaica	5,200	-	6,000	-	6,800	-	7,600	-	8,400	-
Japan	2,654,600	2,654,600	3,063,000	3,063,000	3,648,200	3,648,200	4,077,400	4,077,400	4,506,600	3,802,344
Jordan	2,600	2,600	3,000	3,000	3,400	2,278	3,800	-	4,200	-
Kenya	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Korea, Rep of	46,800	46,800	54,000	54,000	68,000	68,000	76,000	76,000	84,000	84,000
Kuwait	65,000	-	75,000	-	98,600	-	110,200	-	121,800	-
Lebanon	5,200	-	6,000	-	3,400	-	3,800	-	4,200	-
Liberia	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Libyan Arab Jamahiriye	67,600	-	78,000	-	88,400	-	98,800	-	109,200	-
Liechtenstein	2,600	2,600	3,000	3,000	3,400	3,400	3,800	3,800	4,200	2,937
Luxembourg	15,600	-	18,000	-	17,000	-	19,000	-	21,000	-
Madagascar	2,600	1,068	3,000	3,000	3,400	-	3,800	-	4,200	-
Malaysia	23,400	23,400	27,000	27,000	34,000	34,000	38,000	38,000	42,000	42,000
Mali	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Mauritius	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Mexico	226,200	226,200	261,000	-	299,200	299,200	334,400	261,000	369,600	369,600
Monaco	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Mongolia	2,600	2,600	3,000	3,000	3,400	3,400	3,800	3,800	4,200	4,200
Morocco	13,000	13,000	15,000	15,000	17,000	-	19,000	19,000	21,000	-
Myanmar	2,600	-	3,000	3,000	3,400	-	3,800	3,818	4,200	-
Namibia	-	-	-	-	-	-	-	-	-	-
Netherlands	457,600	457,600	528,000	528,000	584,800	584,800	653,600	653,600	722,400	722,400
New Zealand	67,600	-	78,000	-	81,600	-	91,200	-	100,800	-
Nicaragua	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Niger	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Nigeria	49,400	49,400	57,000	57,000	64,600	64,600	72,200	72,200	79,800	-
Norway	130,000	130,000	150,000	150,000	180,200	180,200	201,400	201,400	222,600	222,600
Pakistan	15,600	15,600	18,000	18,000	20,400	20,400	22,800	22,800	25,200	25,200
Panama	5,200	5,200	6,000	2,600	5,800	-	7,600	-	8,400	-
Paraguay	2,600	-	3,000	-	6,800	-	7,600	-	8,400	-
Peru	18,200	-	21,000	-	23,400	-	26,600	-	29,400	-

Member State	1985		1986		1987		1988		1989	
	Share of target $	Amount paid $	Share of target $	Amount paid $	Share of target $	Amount paid $	Share of target $	Amount paid $	Share of target $	Amount paid $
Philippines	23,400	7,928	27,000	6,928	34,000	6,886	38,000	-	42,000	-
Poland	184,600	191,121	213,000	203,593	214,200	183,077	239,400	239,400	264,600	264,600
Portugal	46,800	46,800	54,000	54,000	61,200	61,200	68,400	-	75,600	75,600
Qatar	7,800	-	9,000	-	11,600	-	13,200	-	16,800	-
Romania	49,400	-	57,000	-	64,600	-	72,200	-	79,800	-
Saudi Arabia	221,000	221,000	255,000	-	326,400	-	364,800	-	403,200	-
Senegal	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Sierra Leone	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Singapore	23,400	1,800	27,000	-	34,000	-	38,000	-	42,000	-
South Africa	104,000	-	120,000	-	146,200	-	163,400	-	180,600	-
Spain	496,600	10,000	573,000	10,000	683,400	10,000	763,800	10,000	844,200	10,000
Sri Lanka	2,600	2,600	3,000	3,000	3,400	3,400	3,800	3,800	4,200	4,200
Sudan	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Sweden	338,000	338,000	390,000	390,000	421,600	421,600	471,200	471,200	520,800	520,800
Switzerland	283,400	283,400	327,000	327,000	377,400	377,400	421,800	421,800	466,200	466,200
Syrian Arab Republic	7,800	-	9,000	-	13,600	-	15,200	-	16,800	-
Thailand	20,800	20,800	24,000	24,000	30,600	30,600	34,200	34,200	37,800	37,800
Tunisia	7,800	-	9,000	-	10,200	-	11,400	-	12,600	-
Turkey	83,200	83,200	96,000	96,000	115,600	115,600	129,200	129,200	142,800	-
Uganda	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Ukrainian SSR	338,000	322,581	390,000	458,791	431,800	432,558	482,600	468,923	533,400	533,400
USSR	2,711,800	2,445,452	3,129,000	3,559,097	3,430,600	3,393,481	3,834,200	3,843,541	4,237,800	4,237,800
United Arab Emirates	41,600	41,600	48,000	-	61,200	-	68,400	-	75,600	-
United Kingdom	1,201,200	1,201,200	1,386,000	1,386,000	1,635,400	1,635,400	1,827,800	1,827,800	2,020,200	2,020,200
United Rep of Tanzania	2,600	2,600	3,000	3,000	3,400	3,210	3,800	-	4,200	-
USA	6,500,000	6,370,366	7,500,000	7,008,250	8,500,000	8,208,090	9,500,000	8,914,394	10,500,000	10,128,500
Uruguay	10,400	-	12,000	-	13,600	-	15,200	-	16,800	-
Venezuela	140,400	40,000	162,000	40,000	200,600	-	224,200	40,000	247,800	-
Viet Nam	5,200	-	6,000	-	3,400	-	3,800	-	4,200	-
Yugoslavia	117,000	117,000	135,000	135,000	153,000	153,000	171,000	-	189,000	-
Zaire	2,600	-	3,000	-	3,400	-	3,800	-	4,200	-
Zambia	2,600	2,600	3,000	3,000	3,400	3,400	3,800	3,800	4,200	4,200
Zimbabwe 1/					5,800	-	7,600	-	8,400	-
TOTAL	26,000,000	23,191,501	30,000,000	26,612,543	34,000,000	29,599,448	38,000,000	32,208,029	42,000,000	33,810,871

1/ Zimbabwe became a Member of the Agency on 1 August 1986.

ANNEX VI: FOOTNOTE (A) PROJECTS
INTERNATIONAL ATOMIC ENERGY AGENCY

A. LIST OF FOOTNOTE (A) PROJECTS OR PROJECT COMPONENTS WHICH WERE FUNDED DURING THE PERIOD 1985 - 1989
BY RECIPIENT COUNTRY

COUNTRY / PROJECT	PROG YEAR	EXPERTS MM.DD	EXPERTS $	EQUIPMENT $	FELLOWSHIPS AND TRAINING $	SUB-CONTRACTS $	TOTAL $
BANGLADESH							
BGD/1/011 UTILIZATION OF THE NEUTRON GENERATOR							
	1989	2.00	16 800	23 000	0	0	39 800
	1990	1.00	8 850	0	0	0	8 850
BGD/4/009 RESEARCH REACTOR UTILIZATION							
	1985	1.00	7 500	85 000	0	0	92 500
BGD/4/013 REPAIR AND MAINTENANCE OF NUCLEAR INSTRUMENTS, DHAKA							
	1989	1.00	8 400	25 000	0	0	33 400
BGD/5/013 NUCLEAR TECHNIQUES IN AGRICULTURE							
	1988	3.00	23 850	60 000	0	0	83 850
	1989	2.00	16 800	40 000	0	0	56 800
BGD/5/014 AGROCHEMICAL RESIDUES							
	1989	2.00	16 800	50 000	14 400	0	81 200
BOLIVIA							
BOL/5/004 RADIOISOTOPES IN AGRICULTURE							
	1986	2.00	15 000	30 000	10 800	0	55 800
	1987	3.00	21 600	40 000	0	0	61 600
BOL/6/015 IMPROVEMENT OF NUCLEAR MEDICINE							
	1989	1.00	8 400	0	0	0	8 400
BRAZIL							
BRA/1/029 STUDY OF MULTI-LAYER SEMICONDUCTOR STRUCTURE							
	1988	6.00	47 700	90 000	0	0	137 700
BRA/6/010 RADIOISOTOPES IN MEDICINE							
	1985	0.00	0	120 000	0	0	120 000
BRA/9/019 REACTOR SAFETY RESEARCH PROGRAMME							
	1985	2.00	15 000	125 000	0	0	140 000
BRA/9/023 RADIATION PROTECTION (IRD)							
	1987	2.00	14 400	60 000	0	0	74 400
	1988	2.00	15 000	45 000	0	0	60 000
	1989	2.00	15 600	12 000	0	0	27 600
BRA/9/035 RADIATION PROTECTION IN MEDICAL PRACTICE							
	1989	16.00	134 400	228 000	0	0	362 400
BULGARIA							
BUL/4/003 CONSTRUCTION OF A NEUTRON GENERATOR							
	1985	0.00	0	200 000	0	0	200 000
	1986	0.00	0	200 000	0	0	200 000
BUL/8/011 IRRADIATION FACILITY							
	1988	0.00	0	150 000	0	0	150 000
CAMEROON							
CMR/1/002 NUCLEAR ANALYTICAL LABORATORY							
	1987	2.00	14 400	16 000	0	0	30 400
	1989	1.00	8 400	20 000	0	0	28 400
CHILE							
CHI/4/013 RESEARCH REACTOR CORE CONVERSION (RECH-1)							
	1988	2.00	15 900	0	4 500	0	20 400

A. LIST OF FOOTNOTE (A) PROJECTS OR PROJECT COMPONENTS WHICH WERE FUNDED DURING THE PERIOD 1985 - 1989 BY RECIPIENT COUNTRY

COUNTRY / PROJECT	PROG YEAR	EXPERTS MM.DD	EXPERTS $	EQUIPMENT $	FELLOWSHIPS AND TRAINING $	SUB-CONTRACTS $	TOTAL $
CHINA							
CPR/1/003 SECONDARY STANDARDS DOSIMETRY LABORATORY							
	1987	1.00	7 200	140 000	0	0	147 200
	1988	2.00	15 000	120 000	0	0	135 000
CPR/8/003 GAMMA RADIOGRAPHY							
	1986	3.00	22 500	120 000	0	0	142 500
CPR/9/009 SEVERE ACCIDENT ANALYSIS AND MANAGEMENT							
	1989	3.00	25 200	0	0	0	25 200
COLOMBIA							
COL/4/006 RESEARCH REACTOR CONVERSION							
	1987	1.00	7 200	60 000	0	0	67 200
COL/4/008 UPGRADING OF RESEARCH REACTOR							
	1988	4.00	31 800	30 000	0	0	61 800
COL/8/012 ISOTOPE-AIDED SEDIMENTOLOGY STUDIES							
	1986	1.00	7 500	0	0	0	7 500
COL/9/002 RADIATION PROTECTION							
	1988	2.00	15 900	42 000	0	0	57 900
	1989	2.00	16 800	0	0	0	16 800
COTE D'IVOIRE							
IVC/5/018 FUEL-WOOD PRODUCTION							
	1987	2.00	14 400	20 000	0	0	34 400
	1989	1.00	8 400	15 000	0	0	23 400
CYPRUS							
CYP/5/014 RADIOISOTOPES IN AGRICULTURE							
	1989	1.00	8 400	65 000	16 800	0	90 200
ECUADOR							
ECU/2/008 NUCLEAR ANALYTICAL TECHNIQUES (PHASE II)							
	1989	1.00	8 400	45 000	0	0	53 400
ECU/5/010 MUTATION BREEDING							
	1987	3.00	21 600	50 000	0	0	71 600
ECU/6/008 ADVANCED TRAINING IN MEDICAL PHYSICS							
	1985	4.00	30 000	50 000	0	0	80 000
	1986	4.00	30 000	15 000	0	0	45 000
	1989	6.00	50 400	0	0	0	50 400
ECU/6/009 NUCLEAR MEDICINE SERVICES							
	1985	6.00	45 000	88 000	0	0	133 000
ECU/8/011 INDUSTRIAL APPLICATIONS							
	1988	2.00	15 900	55 000	0	0	70 900
ECU/8/012 ISOTOPE APPLICATIONS IN HYDROLOGY							
	1989	2.00	16 800	47 000	7 200	0	71 000
ECU/9/008 ENVIRONMENTAL RADIOACTIVITY MONITORING							
	1986	1.00	7 500	30 000	0	0	37 500

A. LIST OF FOOTNOTE (A) PROJECTS OR PROJECT COMPONENTS WHICH WERE FUNDED DURING THE PERIOD 1985 - 1989 BY RECIPIENT COUNTRY

COUNTRY / PROJECT	PROG YEAR	EXPERTS MM.DD	EXPERTS $	EQUIPMENT $	FELLOWSHIPS AND TRAINING $	SUB-CONTRACTS $	TOTAL $
EGYPT							
EGY/1/018 MOESSBAUER SPECTROMETRY (AL-AZHAR)	1985	0.00	0	55 000	0	0	55 000
EGY/4/027 QUALITY ASSURANCE	1986	2.00	15 000	200 000	0	0	215 000
	1988	5.00	39 750	100 000	148 500	0	288 250
	1989	2.00	16 800	0	0	0	16 800
EGY/4/029 FEASIBILITY STUDY FOR SMALL AND MEDIUM NUCLEAR POWER PLANTS	1989	12.00	100 800	0	0	0	100 800
EGY/5/017 DETERMINATION OF PESTICIDE RESIDUES	1985	2.00	15 000	66 000	28 500	0	109 500
EGY/5/018 RADIOIMMUNOASSAY IN ANIMAL SCIENCE	1986	1.00	7 500	40 000	0	0	47 500
	1987	2.00	14 400	7 500	0	0	21 900
	1988	2.00	15 900	7 500	0	0	23 400
	1989	1.00	8 400	7 500	0	0	15 900
EGY/6/004 INTRACAVITARY RADIATION THERAPY FOR CANCER	1985	20.00	153 000	424 000	0	0	577 000
	1986	10.00	75 000	206 000	0	0	281 000
EGY/9/014 NUCLEAR SAFETY	1985	20.00	150 000	82 000	0	0	232 000
EGY/9/017 ENVIRONMENTAL RADIOACTIVITY SURVEY (INSHAS)	1985	3.00	22 500	85 000	12 000	0	119 500
	1986	6.00	45 000	0	0	0	45 000
EGY/9/018 COMPUTER-AIDED SAFETY ANALYSIS	1986	6.00	45 000	0	0	0	45 000
EGY/9/020 RADIOLOGICAL SAFETY	1987	5.00	36 000	33 300	0	0	69 300
EL SALVADOR							
ELS/4/003 NUCLEAR INSTRUMENTATION	1988	3.00	23 850	45 000	0	0	68 850
	1989	5.00	42 000	35 000	0	0	77 000
ELS/5/002 ANIMAL DISEASES AND REPRODUCTION	1985	4.00	30 000	40 000	0	0	70 000
	1987	2.00	14 400	6 000	0	0	20 400
ETHIOPIA							
ETH/4/002 NUCLEAR INSTRUMENTATION	1988	3.00	23 850	40 000	0	0	63 850
GHANA							
GHA/5/011 ERADICATION OF RIVERINE TSETSE FLY	1985	3.00	22 500	3 000	0	0	25 500
GHA/5/016 GENETIC IMPROVEMENT OF COCOA AND COFFEE	1988	3.00	23 850	28 000	13 500	0	65 350
GHA/8/006 EVALUATION OF GROUNDWATER RESOURCES	1988	1.00	7 950	113 000	4 500	0	125 450
	1989	1.00	8 400	8 000	4 800	0	21 200

A. LIST OF FOOTNOTE (A) PROJECTS OR PROJECT COMPONENTS WHICH WERE FUNDED DURING THE PERIOD 1985 - 1989
BY RECIPIENT COUNTRY

COUNTRY / PROJECT	PROG YEAR	EXPERTS MM.DD	EXPERTS $	EQUIPMENT $	FELLOWSHIPS AND TRAINING $	SUB-CONTRACTS $	TOTAL $
GREECE							
GRE/1/033 UPGRADING OF NEUTRON SPECTROMETER	1988	1.00	7 950	6 000	0	0	13 950
GRE/1/034 ION IMPLANTATION USING A TANDEM ACCELERATOR	1989	2.00	16 800	95 000	0	0	111 800
GRE/2/015 RADIOPHARMACEUTICALS	1985	0.00	0	28 000	0	0	28 000
GRE/2/020 RADIOPHARMACEUTICALS	1987	0.00	0	105 000	0	0	105 000
GRE/5/014 ISOTOPE-AIDED CROP STUDIES	1986	0.00	0	28 000	0	0	28 000
GUATEMALA							
GUA/1/004 DOSIMETRY LABORATORY (SSDL)	1986	2.00	15 000	40 000	0	0	55 000
	1987	2.00	14 400	100 000	0	0	114 400
	1988	1.00	7 950	100 000	0	0	107 950
GUA/1/005 DOSIMETRY LABORATORY (PHASE II)	1989	1.00	8 400	110 000	7 200	0	125 600
GUA/5/007 CONTROL OF THE MEDITERRANEAN FRUIT FLY	1988	12.00	95 400	30 000	0	0	125 400
	1989	12.00	100 800	20 000	0	0	120 800
HUNGARY							
HUN/2/002 CHEMICAL AND BIOCHEMICAL RESEARCH	1987	0.00	0	330 000	0	0	330 000
HUN/5/012 RADIOACTIVE CONTAMINATION AND FOOD CONTROL	1989	1.00	8 400	90 000	0	0	98 400
HUN/8/006 FOOD IRRADIATION TECHNOLOGY	1985	0.00	0	350 000	0	0	350 000
INDONESIA							
INS/0/004 NUCLEAR MATERIALS ACCOUNTING	1986	5.00	37 500	20 000	0	0	57 500
	1987	0.00	0	27 000	0	0	27 000
INS/0/011 UNIVERSITY RESEARCH AND TEACHING	1989	6.00	50 400	60 000	0	12 000	122 400
INS/1/015 UTILIZATION OF MULTI-PURPOSE RESEARCH REACTOR	1985	4.00	30 000	15 000	6 000	0	51 000
	1986	6.00	48 600	100 000	0	0	148 600
	1987	3.00	26 100	0	0	0	26 100
INS/3/008 URANIUM EXPLORATION	1989	3.00	25 200	30 000	0	0	55 200
INS/3/009 URANIUM EXPLORATION AND DEVELOPMENT	1989	4.00	33 600	10 000	0	0	43 600
INS/4/018 REACTOR PHYSICS	1986	12.00	90 000	38 000	0	0	128 000
INS/5/020 SOIL WATER MANAGEMENT STUDIES	1987	7.00	50 400	25 000	0	0	75 400
INS/7/002 RADIOBIOLOGICAL LABORATORY	1988	1.00	7 950	30 000	0	0	37 950
INS/8/013 RADIOCARBON DATING							

A. LIST OF FOOTNOTE (A) PROJECTS OR PROJECT COMPONENTS WHICH WERE FUNDED DURING THE PERIOD 1985 - 1989 BY RECIPIENT COUNTRY

COUNTRY / PROJECT	PROG YEAR	EXPERTS MM.DD	EXPERTS $	EQUIPMENT $	FELLOWSHIPS AND TRAINING $	SUB-CONTRACTS $	TOTAL $
INTERREGIONAL							
INT/8/002 ELECTRON BEAM TECHNOLOGY FOR FLUE GAS PURIFICATION	1988	6.00	47 700	0	0	0	47 700
IRAN, ISLAMIC REPUBLIC OF							
IRA/9/008 ENVIRONMENTAL RADIOACTIVITY MONITORING	1985	3.00	22 500	7 000	0	0	29 500
JAMAICA							
JAM/4/002 RESEARCH REACTOR CENTRE	1986	6.00	45 000	50 000	0	0	95 000
JORDAN							
JOR/5/004 FOOD IRRADIATION	1989	1.00	8 400	0	0	0	8 400
KENYA							
KEN/6/007 RADIOISOTOPES IN PARASITOLOGY	1986	3.00	22 500	90 000	1 800	0	114 300
KOREA, REPUBLIC OF							
ROK/1/007 STANDARDIZATION OF NEUTRON MEASUREMENTS	1986	1.00	7 500	65 000	0	0	72 500
	1988	1.00	7 950	40 000	13 500	0	61 450
	1989	0.00	0	40 000	0	0	40 000
ROK/3/006 URANIUM EXPLORATION	1987	2.00	14 400	0	0	0	14 400
	1988	2.00	15 900	8 000	0	0	23 900
ROK/4/014 NUCLEAR FUEL CYCLE TECHNOLOGY	1985	4.00	30 000	50 000	0	0	80 000
	1986	2.00	16 200	45 000	0	0	61 200
ROK/4/019 NUCLEAR POWER PLANT OPERATOR TRAINING	1988	5.00	39 750	0	2 250	0	42 000
ROK/5/026 RADIOIMMUNOASSAY IN CATTLE PRODUCTIVITY STUDIES	1987	3.00	21 600	35 000	0	0	56 600
ROK/9/026 ENVIRONMENTAL RADIATION PROTECTION	1985	3.00	22 500	52 000	0	0	74 500
MALAYSIA							
MAL/2/003 LATEX MATURATION STUDIES	1985	0.00	0	72 000	0	0	72 000
MAL/3/006 RADIOACTIVE MINERALS SURVEY	1985	24.00	180 000	62 000	0	0	242 000
MAL/4/006 NUCLEAR INSTRUMENTATION CENTRE	1988	5.00	39 750	36 000	0	0	75 750
	1989	3.00	25 200	0	0	0	25 200
MAL/5/014 PESTICIDE RESIDUES	1987	1.00	7 200	45 000	0	0	52 200
MAL/5/019 RADIATION-INDUCED MUTATION BREEDING	1986	3.00	22 500	19 000	0	0	41 500
MAL/8/003 NUCLEAR APPLICATIONS IN INDUSTRY	1985	2.00	15 000	130 000	0	0	145 000
MAL/8/007 FOOD IRRADIATION	1986	1.00	7 500	30 000	25 200	0	62 700

A. LIST OF FOOTNOTE (A) PROJECTS OR PROJECT COMPONENTS WHICH WERE FUNDED DURING THE PERIOD 1985 - 1989 BY RECIPIENT COUNTRY

COUNTRY / PROJECT	PROG YEAR	EXPERTS MM.DD	EXPERTS $	EQUIPMENT $	FELLOWSHIPS AND TRAINING $	SUB-CONTRACTS $	TOTAL $
MALI							
MLI/3/005 URANIUM EXPLORATION							
	1985	12.00	90 000	25 000	22 500	0	137 500
MEXICO							
MEX/2/011 PARTICLE-INDUCED X-RAY EMISSION TECHNIQUES							
	1988	2.00	15 900	35 000	9 000	0	59 900
MEX/2/012 TRACE-ELEMENT ANALYSIS							
	1989	1.00	8 400	42 000	7 200	0	57 600
MEX/4/034 IN-CORE FUEL MANAGEMENT							
	1985	0.00	0	100 000	0	0	100 000
	1986	2.00	15 000	85 000	0	0	100 000
	1987	2.00	14 400	60 000	35 100	0	109 500
	1988	2.00	15 900	50 000	54 000	0	119 900
MEX/5/013 PLANT MUTATION BREEDING							
	1986	6.00	45 000	60 000	21 600	0	126 600
	1987	6.00	48 600	40 000	23 400	0	112 000
MEX/8/016 RADIATION TECHNOLOGY							
	1988	6.00	47 700	20 000	0	0	67 700
MEX/8/017 CHARACTERIZATION OF GEOTHERMAL RESOURCES							
	1989	2.00	16 800	50 000	0	0	66 800
MOROCCO							
MOR/1/006 TRAINING AND RESEARCH IN NUCLEAR SCIENCE							
	1986	3.00	22 500	52 000	0	0	74 500
	1988	2.00	15 900	25 000	0	0	40 900
MOR/8/003 ISOTOPE TECHNIQUES IN HYDROLOGY							
	1987	4.00	28 800	63 000	23 400	0	115 200
MOR/8/004 ISOTOPES IN HYDROLOGY							
	1988	0.00	0	85 000	0	0	85 000
NIGERIA							
NIR/1/007 NUCLEAR ANALYTICAL TECHNIQUES							
	1988	2.00	15 900	67 000	58 500	0	141 400
NIR/2/004 TRACE-ELEMENT DETERMINATION							
	1988	3.00	23 850	154 000	0	0	177 850
NIR/5/016 OIL PALM PRODUCTION							
	1987	0.00	0	27 500	0	0	27 500
NIR/5/021 PREVENTING TSETSE FLY RE-INVASION (PHASE II)							
	1989	12.00	100 800	150 000	14 400	65 000	330 200
NIR/6/005 NUCLEAR MEDICINE							
	1989	3.00	25 200	30 000	0	0	55 200
PANAMA							
PAN/5/004 GENETIC IMPROVEMENT OF BANANAS, PLANTAINS AND SUGAR-CANE							
	1985	0.00	0	60 000	0	0	60 000
	1987	3.00	21 600	45 000	0	0	66 600

A. LIST OF FOOTNOTE (A) PROJECTS OR PROJECT COMPONENTS WHICH WERE FUNDED DURING THE PERIOD 1985 - 1989 BY RECIPIENT COUNTRY

COUNTRY / PROJECT	PROG YEAR	EXPERTS MM.DD	EXPERTS $	EQUIPMENT $	FELLOWSHIPS AND TRAINING $	SUB-CONTRACTS $	TOTAL $
PARAGUAY							
PAR/5/004 MUTATION BREEDING							
	1988	2.00	15 900	20 000	0	0	35 900
PAR/9/002 RADIATION PROTECTION IN MEDICINE							
	1986	4.00	30 000	50 000	0	0	80 000
PERU							
PER/0/011 DEVELOPMENT OF NUCLEAR RESEARCH CENTRE							
	1985	0.00	0	40 000	0	0	40 000
PER/5/012 MEDFLY CONTROL							
	1985	28.00	214 200	370 000	0	0	584 200
	1986	30.00	233 400	355 000	0	0	588 400
PER/5/014 NUCLEAR TECHNIQUES IN AGRICULTURE							
	1985	8.00	60 000	60 000	0	0	120 000
PER/5/015 PLANT MUTATION BREEDING							
	1986	3.00	22 500	70 000	0	0	92 500
	1987	2.00	14 400	50 000	0	0	64 400
PHILIPPINES							
PHI/1/014 NEUTRON ACTIVATION ANALYSIS							
	1986	0.00	0	80 000	0	0	80 000
PHI/4/016 QUALITY ASSURANCE/QUALITY CONTROL TRAINING CENTRE							
	1985	12.00	90 000	25 000	0	0	115 000
POLAND							
POL/1/006 MASS SPECTROMETRY							
	1985	0.00	0	100 000	0	0	100 000
PORTUGAL							
POR/1/004 STAINLESS STEEL PROPERTIES							
	1987	4.00	28 800	70 000	0	0	98 800
POR/1/005 NEUTRON SCATTERING SPECTROMETER							
	1988	2.00	15 900	49 100	0	0	65 000
POR/2/010 RADIOPHARMACEUTICAL DEVELOPMENT							
	1985	0.00	0	72 500	0	0	72 500
POR/3/008 LEACHING OF ORE FROM THE AZERE REGION							
	1985	0.00	0	40 000	0	0	40 000
POR/3/009 URANIUM EXPLORATION							
	1989	3.00	25 200	25 000	0	0	50 200
POR/5/003 NITROGEN FIXATION							
	1989	2.00	16 800	0	0	0	16 800
POR/8/002 IRRADIATION FACILITY							
	1985	0.00	0	34 000	0	0	34 000
POR/9/005 NUCLEAR POWER PLANT SITING (EDP)							
	1985	3.00	22 500	0	0	0	22 500
POR/9/007 ENVIRONMENTAL RADIOACTIVITY MONITORING							
	1987	3.00	21 600	110 000	0	0	131 600
REGIONAL AFRICA							
RAF/8/010 WATER RESOURCES IN THE NILE VALLEY							
	1986	3.00	22 500	135 000	0	0	157 500

A. LIST OF FOOTNOTE (A) PROJECTS OR PROJECT COMPONENTS WHICH WERE FUNDED
DURING THE PERIOD 1985 - 1989
BY RECIPIENT COUNTRY

COUNTRY / PROJECT	PROG YEAR	EXPERTS MM.DD	EXPERTS $	EQUIPMENT $	FELLOWSHIPS AND TRAINING $	SUB-CONTRACTS $	TOTAL $
REGIONAL ASIA AND PACIFIC							
RAS/6/016 USE OF COMPUTERS IN TECHNETIUM-99M IMAGING							
	1989	1.00	8 400	0	104 000	0	112 400
RAS/8/064 RADIATION AND ISOTOPE APPLICATIONS IN INDUSTRY							
	1989	14.00	117 600	225 000	121 800	0	464 400
RAS/8/065 MARINE CONTAMINANT AND SEDIMENT TRANSPORT							
	1989	5.00	42 000	20 000	0	0	62 000
REGIONAL EUROPE							
RER/4/003 IN-SERVICE INSPECTION DESIGN							
	1989	1.00	8 400	0	0	360 000	368 400
REGIONAL LATIN AMERICA							
RLA/0/006 NUCLEAR SCIENCE AND TECHNOLOGY DEVELOPMENT (ARCAL)							
	1985	12.00	90 000	120 000	45 000	0	255 000
RLA/2/003 NUCLEAR ANALYTICAL TECHNIQUES (ARCAL IV)							
	1986	0.00	0	0	54 000	0	54 000
RLA/4/006 NUCLEAR INSTRUMENTATION (ARCAL II)							
	1987	2.00	14 400	60 000	0	0	74 400
	1988	2.00	15 900	70 000	0	0	85 900
	1989	2.00	16 800	70 000	0	0	86 800
RLA/4/007 RESEARCH REACTOR UTILIZATION (ARCAL V)							
	1986	0.00	0	0	43 200	0	43 200
	1987	7.00	50 400	35 000	46 800	0	132 200
	1989	2.00	16 800	25 000	60 000	0	101 800
RLA/5/020 FOOD IRRADIATION (ARCAL VI)							
	1986	3.00	22 500	0	0	0	22 500
RLA/5/021 IMPROVEMENT OF CEREALS THROUGH MUTATION BREEDING (ARCAL VII)							
	1986	6.00	45 000	0	0	0	45 000
	1987	4.00	28 800	100 000	0	0	128 800
	1988	0.00	0	320 000	0	0	320 000
	1989	3.00	25 200	50 000	0	0	75 200
RLA/5/023 NUCLEAR TECHNIQUES IN AGRICULTURE (ARCAL XI)							
	1988	4.00	31 800	0	0	0	31 800
	1989	4.00	33 600	0	0	0	33 600
RLA/6/011 RADIOIMMUNOASSAY OF THYROID-RELATED HORMONES (ARCAL VIII)							
	1988	2.00	15 900	32 000	39 000	0	86 900
	1989	2.00	16 800	0	0	0	16 800
RLA/8/005 NON-DESTRUCTIVE TESTING IN LATIN AMERICA							
	1987	5.00	36 000	70 000	158 000	0	264 000
	1988	5.00	39 750	70 000	170 000	0	279 750
RLA/8/013 NON-DESTRUCTIVE TESTING TECHNIQUES							
	1989	11.00	92 400	233 000	277 000	130 000	732 400
RLA/8/014 APPLICATION OF ISOTOPE TECHNIQUES IN HYDROLOGY							
	1989	7.00	58 800	100 000	35 000	0	193 800
RLA/9/009 RADIATION PROTECTION (ARCAL I)							
	1989	0.00	0	30 000	50 000	0	80 000
ROMANIA							
ROM/1/005 APPLIED ACTINIDE RESEARCH							
	1985	2.00	15 000	56 000	0	0	71 000
ROM/1/009 HEAVY ION PHYSICS							
	1985	2.00	15 000	50 000	7 500	0	72 500

A. LIST OF FOOTNOTE (A) PROJECTS OR PROJECT COMPONENTS WHICH WERE FUNDED DURING THE PERIOD 1985 - 1989 BY RECIPIENT COUNTRY

COUNTRY / PROJECT	PROG YEAR	EXPERTS MM.DD	EXPERTS $	EQUIPMENT $	FELLOWSHIPS AND TRAINING $	SUB-CONTRACTS $	TOTAL $
SRI LANKA							
SRL/4/010 NUCLEAR ENGINEERING (MORATUWA)	1988	3.00	23 850	12 000	0	0	35 850
SRL/5/016 CROP WATER AND SOIL MANAGEMENT	1985	0.00	0	45 000	0	0	45 000
SRL/6/010 NUCLEAR MEDICINE	1989	1.00	8 400	102 000	0	0	110 400
SRL/8/014 TRACER TECHNIQUES IN INDUSTRY	1987	1.00	7 200	50 000	0	0	57 200
SUDAN							
SUD/0/006 NUCLEAR SCIENCE LABORATORY	1985	1.00	7 500	40 000	0	0	47 500
SUD/3/003 URANIUM GEOLOGY AND EXPLORATION METHODS	1985	8.00	60 000	46 000	6 000	0	112 000
SUD/4/003 NUCLEAR INSTRUMENTATION	1988	2.00	15 900	20 000	0	0	35 900
SUD/5/012 PESTICIDE RESIDUES	1988	1.00	7 950	10 000	0	0	17 950
SUD/6/012 USE OF GAMMA CAMERA	1986	3.00	21 600	90 000	0	0	111 600
SYRIAN ARAB REPUBLIC							
SYR/0/004 NUCLEAR TRAINING LABORATORY	1985	7.00	52 500	36 000	9 000	0	97 500
SYR/1/002 NUCLEAR ANALYTICAL LABORATORY	1985	1.00	7 500	35 000	0	0	42 500
SYR/3/003 URANIUM RECOVERY FROM PHOSPHORIC ACID	1986	2.00	15 000	70 000	0	0	85 000
SYR/9/003 RADIATION PROTECTION	1985	0.00	0	40 000	18 000	0	58 000
THAILAND							
THA/1/008 CALIBRATION AND STANDARDIZATION OF RADIONUCLIDES	1988	2.00	15 900	70 000	0	0	85 900
THA/2/008 NUCLEAR CHEMISTRY TRAINING	1985	2.00	15 000	52 000	0	0	67 000
THA/2/009 RADIOCHEMISTRY TRAINING	1986	7.00	52 500	50 000	0	0	102 500
THA/4/010 UPGRADING OF A RESEARCH REACTOR	1986	5.00	37 500	55 000	0	0	92 500
THA/5/027 FISH PRODUCTION AND PRESERVATION	1986	2.00	15 000	33 000	43 200	0	91 200
THA/5/030 ENVIRONMENTAL POLLUTION	1985	2.00	15 000	42 000	0	0	57 000
THA/5/035 PESTICIDE RESIDUES	1988	2.00	15 900	70 000	27 000	0	112 900
	1989	2.00	16 800	15 000	28 800	0	60 600
THA/5/036 ANIMAL DISEASES	1989	1.00	8 400	25 000	0	0	33 400
THA/6/017 MEDICAL PHYSICS (SSDL)	1985	1.00	7 500	50 000	0	0	57 500
THA/6/024 TREATMENT PLANNING AND CLINICAL DOSIMETRY	1988	2.00	15 900	70 000	0	0	85 900

A. LIST OF FOOTNOTE (A) PROJECTS OR PROJECT COMPONENTS WHICH WERE FUNDED DURING THE PERIOD 1985 - 1989 BY RECIPIENT COUNTRY

COUNTRY / PROJECT	PROG YEAR	EXPERTS MM.DD	EXPERTS $	EQUIPMENT $	FELLOWSHIPS AND TRAINING $	SUB-CONTRACTS $	TOTAL $
TUNISIA							
TUN/8/010 ADVANCED NON-DESTRUCTIVE TESTING TECHNIQUES IN INDUSTRY	1989	3.00	25 200	65 000	0	0	90 200
UNITED REPUBLIC OF TANZANIA							
URT/6/003 EPIDEMIOLOGY OF MALARIA	1985	2.00	15 000	0	18 000	0	33 000
	1986	0.00	0	8 000	0	0	8 000
	1987	0.00	0	8 000	0	0	8 000
URT/8/006 GROUNDWATER MONITORING IN THE DODOMA REGION	1988	2.00	15 900	20 000	0	0	35 900
URUGUAY							
URU/2/006 RADIOCHEMISTRY	1985	1.00	7 500	30 000	0	0	37 500
URU/5/015 ASSESSMENT OF SOIL EROSION LOSSES	1985	5.00	37 500	0	0	0	37 500
	1986	3.00	22 500	25 000	0	0	47 500
URU/6/013 RADIOPHARMACOLOGY (DR)	1985	1.00	7 500	35 000	0	0	42 500
URU/6/016 USE OF COMPUTERS IN NUCLEAR MEDICINE	1986	0.00	0	76 000	0	0	76 000
URU/6/017 RADIOPHARMACOLOGY (CIN)	1986	3.00	22 500	48 000	0	0	70 500
VENEZUELA							
VEN/9/003 LOW-LEVEL RADIATION LABORATORY	1989	2.00	16 800	55 000	0	0	71 800
YUGOSLAVIA							
YUG/1/010 NUCLEAR ANALYTICAL LABORATORY	1986	0.00	0	240 000	0	0	240 000
YUG/1/012 NUCLEAR ANALYTICAL TECHNIQUES	1989	1.00	8 400	35 000	0	0	43 400
YUG/3/008 GEOCHEMICAL FLUORIMETRIC LABORATORY	1985	2.00	15 000	40 000	0	0	55 000
YUG/4/025 QUALIFICATION OF NUCLEAR POWER PLANT EQUIPMENT	1988	2.00	15 900	135 000	0	0	150 900
YUG/6/006 NUCLEAR TECHNIQUES IN MEDICINE	1986	0.00	0	9 000	0	0	9 000
YUG/9/018 REACTOR SAFETY STUDIES	1985	3.00	22 500	0	0	0	22 500
YUG/9/026 GROUP TRAINING IN NUCLEAR SAFETY	1989	4.00	33 600	0	0	0	33 600
ZAIRE							
ZAI/9/003 RADIOACTIVITY MONITORING	1985	0.00	0	24 000	9 000	0	33 000
ZIMBABWE							
ZIM/5/003 NUCLEAR TECHNIQUES IN BIOCHEMISTRY	1988	0.00	0	47 000	0	0	47 000

ANNEX VI

B. SUPPORT FOR FOOTNOTE-a/ PROJECTS BY DONOR

Certain Member States have indicated that their extrabudgetary contributions for footnote-a/ projects be used preferentially or exclusively for non-nuclear weapon states Parties to the NPT. During the period January 1985-December 1989, extrabudgetary contributions in support of footnote-a/ projects were received with the condition that funds be used in countries Parties to the NPT from the following countries:

Donor	Amount contributed ($)
Soviet Union	4,016,835
UK	3,919,840
USA	6,097,000
Total	14,033,675

During the same period, contributions in support of footnote-a/ projects not formally limited to countries Parties to the NPT were received from the following donors:

Donor	Amount contributed ($)
Belgium	52,000
Canada	25,200
Chile	19,350
Colombia	3,250
CEC	312,633
Finland	374,500
France	496,400
Germany, Federal Republic of	4,865,459
IFFIT	6,000
Italy	2,222,000
Japan	388,000
Republic of Korea	100,000
Spain	92,005
Total	8,956,797

Extrabudgetary funds for footnote-a/ projects have thus provided significant support to developing countries Parties to the NPT for projects dealing with peaceful applications of atomic energy. During the five-year period under review, a total of $22,990,472 was made available for footnote-a/ projects, with the bulk of the funds designated for countries Parties to the NPT.

A number of Member Sates also contributed extrabudgetary funds for technical co-operation activities other than footnote-a/ projects namely, contributions for training activities and special large-scale projects.

ANNEX VII
ASSISTANCE IN KIND

Many Member States made, in addition to their cash contributions, donations in kind (equipment, materials, expert services, fellowships, etc.) The total value of such assistance during the period 1985-89 amounted to $12.7 million (see table below). Of this amount, only $823,100 or 6.5% was provided to non-NPT Member States.

Assistance in kind from 1985 to 1989
(in thousands of dollars)

Year	Experts	Equipment	Fellowship	Group training & sub-contracts	Sub-total
1985	501.9	122.9	1,484.7	655.9	2,765.4
1986	676.7	-	1,504.5	100.7	2,281.9
1987	171.5	-	2,514.7	379.6	3,065.8
1988	290.0	55.7	1,542.5	434.3	2,322.5
1989	619.6	18.0	1,431.4	206.4	2,275.4
Total	2,259.7	196.6	8,477.8	1,776.9	12,711.0

During the period January 1985-December 1989 such additional extrabudgetary funds were received from the following donors:

Donor	Amount contributed ($)
Australia	821,215
Belgium	142,908
Canada	39,866
Chile	20,000
CEC	47,145
Germany, Federal Republic of	427,648
Italy	256,000
Japan	1,193,733
Kuwait	350,000
Sweden	785,465
Asia and Development Bank	90,000
UNIDO	43,322
UNESCO	6,000
Total	4,223,302

The bulk of these resources was made available to developing countries Parties to the NPT.

CONFERENCES, SYMPOSIA AND SEMINARS
September 1985 - September 1990

September - December 1 9 8 5

1. Conferences

2. Symposia

- International Symposium on Source Term Evaluation for Accident Conditions, Columbus, Ohio, USA, 28 October - 1 November

- International Symposium on Emergency Planning and Preparedness for Nuclear Facilities, Rome, Italy, 4-8 November

3. Seminars

- Seminar on Costs and Financing of Nuclear Power Programmes in Developing Countries, Vienna, Austria, 9-12 September

- Seminar on Applied Research and Service Activities for Research Reactor Operations, Copenhagen, Denmark, 9-13 September

- INIS Training Seminar, Vienna, Austria, 7-11 October
- INIS Workshop, Vienna, Austria, 14-18 October

- Seminar on Applications of Isotope & Nuclear Techniques in Hydrology in Arid & Semi-Arid Lands, Adana, Turkey, 14-25 October

- Seminar on Modifications Required for Safety of Nuclear Facilities (Backfitting), Munich, Federal Republic of Germany, 11-14 November

- Seminar on Practices for Radiation Sterilization for Medical Supplies suited for the Upgrading of Local Health Care Services for Developing Countries in Africa and the Middle East, Nairobi, Kenya, 2-6 December

1 9 8 6

1. Conferences

- 11th International Conference on Plasma Physics and Controlled Nuclear Fusion Research, Kyoto, Japan, 13-20 November

2. Symposia

- International Symposium on the Siting, Design and Construction of Underground Repositories for Radioactive Wastes, Hanover, Federal Republic of Germany, 3-7 March

- IAEA/NEA International Symposium on the Optimization of Radiation Protection, Vienna, Austria, 10-14 March

- FAO/IAEA International Symposium on the Use of Nuclear Techniques in Studies of Animal Production and Health in Different Environments, Vienna, Austria, 17-21 March 1986

- IAEA International Symposium on the Packaging and Transport of Radioactive Materials (PATRAM 86), Davos, Switzerland, 16-20 June

- International Symposium on Radiotherapy in Developing Countries - Present Status and Future Trends, Vienna, Austria, 1-5 September

- International Symposium on the Significance and Impact of Nuclear Research in Developing Countries, Athens, Greece, 8-12 September

- International Symposium of Improvements in Water Reactor Fuel Technology and Utilization, Stockholm, Sweden, 15-19 September

- International Symposium on Nuclear Material Safeguards, Vienna, Austria, 10-14 November

3. Seminars

- Seminar for Asia and the Pacific on Quality Assurance for Nuclear Power Plants, Manila, Philippines, 20-24 January

- Seminar on Regulatory Inspection during Nuclear Power Plant Construction, Commissioning and Operation, Vienna, Austria, 7-11 April

- FAO/IAEA Seminar for Asia and the Pacific on the Practical Application of Food Irradiation, Shanghai, China, 7-11 April

- Seminar on Supporting Industrial Infrastructure Requirements and Development for Nuclear Power, Vienna, Austria, 14-18 April

- Seminar on Operating Procedures for Abnormal Conditions in Nuclear Power Plants, Munich, Federal Republic of Germany, 23-27 June

- IAEA/UNESCO Seminar on Isotope Hydrology Techniques for Asia and the Pacific, Jakarta, Indonesia, 30 June - 11 July

- Seminar on Management Options for Low- and Intermediate Level Wastes in Latin America, Rio de Janeiro, Brazil, 13-17 October

- Seminar on Radionuclide Generator Technology, Vienna, Austria, 13-17 October

- INIS Regional Training Seminar for Eastern Europe, Berlin, German Democratic Republic, 20-24 October

- Seminar for Developing Countries in Africa on Quality Control of Nuclear Medicine Instruments, Cairo, Egypt, 23 - 27 November

- Seminar for Developing Countries in Africa, Asia and the Pacific on Stable Isotopes in Human Nutritional and Medical Studies, Vienna, Austria, 25-28 November

1 9 8 7

1. Conferences

- International Conference on Nuclear Power Performance and Safety, Vienna, Austria, 28 September - 2 October

2. Symposia

- IAEA/UNESCO International Symposium on the Use of Isotope Techniques in Water Resources Development, Vienna, Austria, 30 March - 3 April

- IAEA/NEA International Symposium on the Back-End of the Nuclear Fuel Cycle - Strategies and Options, Vienna, Austria, 11-15 May

- International Symposium on Safety Aspects of Ageing and Maintenance of Nuclear Power Reactors, Vienna, Austria, 29 June - 3 July

- IAEA/WHO International Symposium on Dosimetry in Radiotherapy, Vienna, Austria, 31 August - 4 September

- International Symposium on the Utilization of Multi-Purpose Research Reactors and Related International Co-operation, Grenoble, France, 19-23 October

- FAO/IAEA International Symposium on Modern Insect Control: Nuclear Techniques and Biotechnology, Vienna, Austria, 16-20 November

- FAO/IAEA International Symposium on Changing Perspectives in Agrochemicals: Isotopic Techniques for the Study of Food and Environmental Implications, Neuherberg, Federal Republic of Germany, 24-27 November

3. Seminars

- FAO/IAEA Seminar for Latin America on Improving the Reproductive Efficiency and Health of Livestock through Radioimmunoassay and Related Techniques, Maracay, Venezuela, 2-6 March

- Seminar on the Application of Computer Technology to Radiation Protection, Bled, Yugoslavia, 22-26 June

- Seminar for Asia and the Pacific on Calibration Procedures in Secondary Standard Dosimetry Laboratories (SSDLs), Kuala Lumpur, Malaysia, 13-17 June

- IAEA/UNESCO/GSF Seminar on the Application of Isotope Techniques in Hydrology in Latin America, Mexico, D.F., Mexico, 28 September - 2 October

- INIS Training Seminar, Vienna, Austria, 12-23 October

- Seminar on Nuclear Techniques in Parasitic Infections for Developing Countries in Africa, Nairobi, Kenya, 30 November - 4 December

1988

1. Conferences

- IAEA/CEC/OECD/NEA International Conference on Man-Machine Interface in the Nuclear Industry (Control and Instrumentation, Robotics and Artificial Intelligence), Tokyo, Japan, 15-19 February

- International Conference on Radiation Protection in Nuclear Energy, Sydney, Australia, 18-22 April

- 12th International Conference on Plasma Physics and Controlled Nuclear Fusion Research, Nice, France, 12-19 October

2. Symposia

- IAEA/NEA International Symposium on Severe Accidents in Nuclear Power Plants, Sorrento, Italy, 21-25 March
- IAEA/CEC International Symposium on Management of Low- and Intermediate-Level Radioactive Wastes, Stockholm, Sweden, 16-20 May
- IAEA/OECD International Symposium on the Feedback of Operational Safety Experience from Nuclear Power Plants, Paris, France, 16-20 May
- IAEA/WHO International Symposium on Applications of Dynamic Functional Studies in Nuclear Medicine in Developing Countries, Vienna, Austria, 15-19 August
- International Symposium on Regulatory Practices and Safety Standards for Nuclear Power Plants, Munich, Federal Republic of Germany, 7-10 November

3. Seminars

- FAO/IAEA Seminar on Food Irradiation for Developing Countries in Africa, Dakar, Senegal, 15-19 February
- Regional Seminar for European INIS experts, Karlsruhe, Federal Republic of Germany, 6-10 June
- FAO/IAEA Seminar on the Improvement of Crops in Africa through the Use of Induced Mutation, Lusaka, Zambia, 20-24 June
- Seminar on New Approaches in Practices and Process Technology for the Radiation Sterilization of Medical Supplies, Laval, Canada, 25-29 July
- WHO/IAEA Seminar on Training in Nuclear Medicine in Developing Countries, Vienna, Austria, 8-12 August 1988
- Seminar on Radiation Protection Services for Developing Countries in Africa, Nairobi, Kenya, 5-9 September
- Seminar on Industrial Radiation on Industrial Radiation Applications for the Region of Latin America, Quito, Ecuador, 3-6 October
- INIS Regional Training Seminar for Asia and the Pacific for Input Preparation and Output Utilization, Beijing, China, 4-9 October
- Seminar for Asia and the Pacific on Nuclear Techniques in Parasitic and Communicable Diseases, Bombay, India, 21-25 November

1989

1. Conferences

2. Symposia

- International Symposium on Fire Protection and Fire-fighting in Nuclear Installations, Vienna, Austria, 27 February - 3 March
- CEC/IAEA/NEA International Symposium on the Safety Assessment of Radioactive Waste Repositories, Paris, France, 9-12 October
- FAO/IAEA/WHO/UNEP International Symposium on Environmental Contamination following a Major Nuclear Accident, Vienna, Austria, 16-20 October
- International Symposium on Research Reactor Safety, Operations and Modifications, Chalk River, Canada, 23-27 October
- International Symposium on Recovery Operations in the Event of a Nuclear Accident or Radiological Emergency, Vienna, Austria, 6-10 November

3. Seminars

- FAO/IAEA Regional Seminar on the Sterile Technique for Fruit Fly Control or Eradication in Latin America, Guatemala City, Guatemala, 17-21 April
- FAO/IAEA Regional Seminar on Improving Health and Reproductive Efficiency of Livestock through Radioimmunoassay and Related Techniques for Developing Countries in Africa, Harare, Zimbabwe, 4-8 September
- Regional Seminar for Latin America on Calibration Procedures in Secondary Standard Dosimetry Laboratories (SSDLs), Rio de Janeiro, Brazil, 2-6 October
- Regional Seminar for Latin America on Nuclear Techniques in Parasitic and Communicable Infections, Belo Horizonte, Brazil, 30 October - 3 November
- Regional Seminar for Asia and the Pacific on Nuclear Research Centres in the Service of Environmental Research; Service-Client-Sponsor Relationships, Serpong/Jakarta, Indonesia, 20-24 November
- Regional Seminar for Developing Countries in Africa on Organization and Training in Radiotherapy, Cairo, Egypt, 11-15 December

Seminar for Developing Countries in Africa, the Middle East, Asia and the Pacific on the Application of Isotope and Geochemical Techniques in Geothermal Exploration, Izmir, Turkey, 16-27 October

- INIS Training Seminar, Vienna, Austria, 9-13 October
- INIS Workshop, Vienna, Austria, 16-20 October

January - September 1990

1. Conferences

- 13th International Conference on Plasma Physics and Controlled Nuclear Fusion Research, Washington D.C., USA, 3-8 September

2. Symposia

- International Symposium on Radiation Protection Infrastructure, Munich, Federal Republic of Germany, 7-11 May

- International Symposium on the Delivery of Scientific Information Services, Moscow, USSR, 21-23 May (?)

- International Symposium on Nuclear Techniques in the Exploration and Exploitation of Energy and Mineral Resources, Moscow, USSR, 4-8 June (?)

- International Symposium on the Contribution of Plant Mutation Breeding to Crop Improvement, Vienna, Austria, 18-22 June

- International Symposium on Balancing Automation and Human Action in Nuclear Power Plants, Munich, Federal Republic of Germany, 9-13 July

3. Seminars

- IAEA/NEA Seminar on Spent Fuel Storage-Safety, Engineering and Environmental Aspects, Tokyo, Japan, March (?)

- 1st Regional Seminar for Europe and the Middle East on Management of Quality for Nuclear Power Projects, Prague, Czechoslovakia, 23-27 April

- IAEA/NEA Seminar on the Use of Incident Reports for Improving Nuclear Safety, Vienna, Austria, 28 May - 1 June

- IAEA/WHO Seminar on the Application of Nuclear Techniques in the Early Diagnosis of Cancer in Developing Countries, Vienna, Austria, 25-29 June